

**Phillip E. Johnson**

**Jefferson E. Peyser**  
**Professor of Law, emeritus**  
**School of Law**  
**University of California, Berkeley**

**Phillip Johnson Bibliography**

[ [Books](#) ] [ [Articles](#) ] [ [Book Reviews](#) ]

**E-mail Phillip Johnson**

**Books**

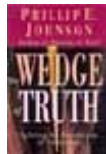


**Darwin on Trial**

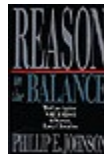


**The Right Questions**

Answering the Toughest Questions  
about Intelligent Design

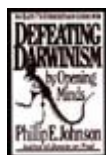


**The Wedge of Truth**



**Reason in the Balance:**

The Case Against Naturalism in  
Science, Law, & Education

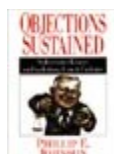


**Defeating Darwinism - By  
Opening Minds**



**Evolution as Dogma:**

The Establishment of Naturalism



**Objections Sustained**  
Subversive Essays on Evolution,  
Law and, Culture



**Darwinism: Science or Philosophy?**  
Proceedings of SMU Symposium

---

**ARN YouTube Channel**



### **Darwinism on Trial**

Phillip Johnson at UC-Irvine



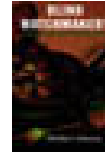
### **Can Science Know the Mind of God?**

Lecture at Princeton University



### **Darwinism: Science or Naturalistic Philosophy?**

Johnson v. Provine Debate at Stanford University



### **Blind Watchmaker? A Skeptical Look at Darwinism**



### **One Nation Under Darwin**

COMING SOON



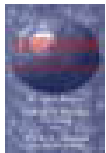
### **How Darwinists Think**



### **Raising Questions about Evolution in the Schools**



### **The Right Questions**



### **Focus on Darwinism: An Interview with Phillip E. Johnson**

## **Books**

### **Defeating Darwinism -- By Opening Minds**

InterVarsity Press, 1997.

### **Reason in the Balance: The Case Against Naturalism in Science, Law & Education**

InterVarsity Press, 1995.

### **Darwin on Trial**

Regnery Gateway, 1991. Revised edition (with response to critics), InterVarsity Press, 1993. Chinese and Spanish translations are also in print.

**Criminal Law: Cases, Materials, and Text**

West Pub. Co., Fifth edition 1995.

**Criminal Procedure: Cases and Commentary**

West Publishing Company, Second Edition 1994.

[Articles](#)

"Retroactivity in Retrospect," 56 Calif. L. Rev. 1612 (1968)

"Multiple Punishment and Consecutive Sentences: Reflections on the Neal Doctrine," 58 Calif. L. Rev. 357 (1970)

"Federal Parole Procedures," 25 Administrative Law Rev. 459- 529 (1973)

"The Unnecessary Crime of Conspiracy," 61 Calif. L. Rev. 1137 (1973). Reprinted in A Criminal Law Anthology, Arnold H. Loewy ed., Anderson Publishing Company, 1992; A Corporate and White Collar Crime Anthology (L. Orland ed., Anderson Pub. Co. 1995).

"The Accidental Decision and How it Happens," 65 Calif. L. Rev. 231 (March 1977).

Messinger and Johnson, "California's Determinate Sentencing Statute: History and Issues," in Determinate Sentencing - Reform or Regression.

"Problems in American Legal Education and Practice," 23 Seoul (Korea) Law Journal 6 (1982)

"Do You Sincerely Want to Be Radical?" 36 Stanford Law Review 247 (1984)

"The Return of the 'Christian Burial Speech' Case," 32 Emory Law Journal 349 (1983).

"Strict Liability: The Prevalent View," in Encyclopedia of Crime and Justice (Kadish ed., Free Press 1983).

"Cruel and Unusual Punishment," in Encyclopedia of Crime and Justice (Kadish ed. Free Press 1983).

"Book Review Essay" on N. Norris, Madness and the Criminal Law and American Psychiatric Association, Statement on the Insanity Defense, 50 U. Chicago L. Rev. 1534 (1983).

"The Turnabout in the Insanity Defense," in Tonry & Morris ed., Crime and Justice: An Annual Review of Research, Vol. 6 (1984).

"Concepts and Compromise in First Amendment Religious Doctrine," 72 Calif. L. Rev. 817 (1984). Reprinted in The International Library of Essays in Law and Legal Theory (T. Campbell ed. Dartmouth Pub. Co., England, 1991), and (partial) in The First Amendment: A READER (J. Garvey & F. Schauer ed., West Pub. Co. 1992).

"A Statutory Replacement for the Miranda Doctrine," 24 American Criminal Law Review 303 (1987).

"Some Thoughts about Natural Law," 75 California Law Review 217, (1987).

"The ACLU Philosophy and the Right to Abuse the Unborn," Criminal Justice Ethics, Winter/Spring 1990, p. 48. Reprinted in *Expecting Trouble: Surrogacy, Fetal Abuse & New Reproductive Technologies* (P. Boling ed., Westview 1995).

Symposium: "Evolution as Dogma: The Establishment of Naturalism," First Things, Sept.-Oct. 1990.

"Response to Critics," First Things, November, 1990.

"Comparing Hostage Takers," Pascal Centre Notebook, July 1990.

"The Creationist and the Sociobiologist: Two Stories about Illiberal Education," Calif. Law Review, vol. 80, p. 1071, July, 1992.

"Creator or Blind Watchmaker?", First Things, January, 1993.

Debate on this essay appeared under the title "God and Evolution: An Exchange between Howard Van Till and Phillip E. Johnson," First Things, June/July 1993.

"The Modernist Impasse in Law," in *God & Culture*, Carson & Woodbridge ed., Eerdmann's, 1993, pp. 180-194. This essay was also published in First Things, March 1993, with the title "Nihilism and the End of Law."

"What is Darwinism?" in the collection *Man and Creation: Perspectives in Science and Theology*, Michael Bauman ed., Hillsdale College Press, 1993. This Collection also included the VanTill/Johnson debate, reprinted from the June/July 1993 issue of First Things (see above).

*School Vouchers and the United States Constitution*, in *The School Choice Controversy: What is Constitutional?*, James W. Skillen ed., Baker Books, 1993

"What Causes AIDS? It's an Open Question," (with Charles A. Thomas, Jr. and Kary B. Mullis). Reprinted in *Our Times: Readings from Recent Periodicals* (R. Atwan ed., Bedford Books of St. Martin's, 4th ed. 1995).

"Darwinism's Rules of Reasoning," (keynote address) and "Darwinism and Theism," in *Darwinism: Science or Philosophy* (J. Buell and V. Hearn ed., Foundation for Thought and Ethics, 1994). This collection comprises the papers presented at a Conference on my book *Darwin on Trial* at Southern Methodist University in Dallas in 1992. A revised version of my keynote address "Darwinism's Rules of Reasoning" was also published in *The California Anthropologist* (1992 issue) and in the Italian journal *Rivista di Biologia*, *Biology Forum* 87, 1994, pp.297-319.

"The Thinking Problem in HIV-Science," in *AIDS: Infectious or Not?* (Duesberg ed. Kluwer 1995)

"Is God Unconstitutional?", 66 Univ. of Colorado Law Review 461 (1995).

"Honesty is the Best Policy," The Scientist, April 17, 1995, p. 12.

"Shouting Heresy in the Temple of Darwin," Christianity Today, October 24, 1994, pp. 22-26.

"HIV and AIDS: The Present State of the Controversy," Reappraising AIDS (Dec. 1994).

"AIDS and the Dog That Didn't Bark," Insight, Feb. 14, 1994, pp. 24-26

"What (If Anything) Hath God Wrought: Academic Freedom and the Religious Professor,"  
Academe, Sept./Oct. 1995

### Book Reviews

L. Weinreb, Importing Justice 87 Yale L.J. 406 (1977)

D. Pannick, Judicial Review of the Death Penalty 31 American Journal of Comparative Law  
138 (1983)

D.A.J. Richards, Sex, Drugs, and the Law: an Essay on Human Rights and  
Overcriminalization, 33 Journal of Legal Education 391 (1983)

G. Edward White, Earl Warren: A Public Life, 66 Judicature 375 (1983)

W.R. Bird, The Origin of Species Revisited, 7 Constitutional Commentary 1801 (1990)

Anthony Lewis, Gideon's Trumpet, (Introduction to the Legal Classics Edition)

Mike Bryan, Chapter and Verse, First Things, Dec. 1991, p. 51.

David M. Raup, Extinction: Bad Genes or Bad Luck?, The Atlantic, Vol. 269, No. 2 (Feb  
1992).

Carl Degler, In Search of Human Nature: The Decline and Revival of Darwinism in American  
Social Thought, in First Things, May 1993, p. 38.

Stephen L. Carter, The Culture of Disbelief, in First Things, December, 1993, p. 48.

George M. Marsden, The Soul of the American University, and Douglas Sloan, Faith and  
Knowledge, in First Things, March 1995, p. 51.

Robert F. Nagel, Judicial Power and American Character, in First Things, May 1995, p. 62.

Peter Washington, Madame Blavatsky's Baboon, First Things, June/July 1995, p. 45.

John Brockman, The Third Culture, Books and Culture, Sept./Oct. 1995.

Daniel Dennett, Darwin's Dangerous Idea, *The New Criterion*, October, 1995. [See also correspondence published in the issues for February and March 1966.]

Steven D. Smith, Preordained Failure: The Quest for a Constitutional Principle of Religious Freedom; and William Bentley Ball, Mere Creatures of the State? Education, Religion, and the Courts, *Books and Culture*, November/December 1995.

Paul Jerome Croce, Science and Religion in the Era of William James: The Eclipse of Certainty, 1820-1880, in *Books and Culture*, Jan/Feb 1996.

Richard Posner, Overcoming Law, *First Things*, January 1996.

Elinor Burkett, The Gravest Show on Earth: America in the Age of AIDS, *First Things*, March, 1966

*San Francisco Chronicle*, Friday, December 19, 1997, p.A 25

## Articles by Phillip E. Johnson

### Miscellaneous Articles

- [The Church of Darwin](#) (8.27.99)  
Reprinted from *The Wall Street Journal*, August 16, 1999.
- [Comparing Hostage Takers](#) (5.13.97)  
Paper written before the publication of *Darwin on Trial*, in which Phillip Johnson attempts to find common ground with theistic evolutionists.
- [The Creationist and the Sociobiologist](#) (6.7.97)  
Reprinted from *California Law Review*, Volume 80, Number 4, July 1992.
- [Darwinism's Rules of Reasoning](#) (9.11.96)  
This paper was originally delivered at a plenary session of the Southwestern Anthropological Association in Berkeley, California in April, 1992. It was subsequently published in the *California Anthropologist* and in *Rivista di Biologia* (1994) (in Italian and English). A similar lecture is included in the collection *Darwinism: Science or Philosophy?* (Buell & Hearn ed. 1994).
- [Darwinists Squirm Under Spotlight](#) (2.22.97)  
Reprinted from an interview with *Citizen Magazine*, January 1992.
- [How Can We Tell Science from Religion?](#) (10.18.98)  
Paper delivered at the Conference on the Origin of Intelligent Life in the Universe, September 28-31, 1998.
- [Is God Unconstitutional?](#)  
[The Established Religious Philosophy of America](#) (9.2.96)

Aa discussion of modernism, and the danger it poses to true scientific objectivity.

- [Keeping the Darwinists Honest](#) (5.10.99)  
Reprinted from an interview with *Citizen Magazine*, April 1999.
- [Lecture Report: Meave Leakey Announces New Hominid Genus](#) (3.27.01)  
Meave Leakey lectured in San Francisco the evening of Thursday, March 22, the very day of the official publication (in *Nature*) of her team's claim to have discovered a new genus of hominid. Phillip Johnson provides this report of the lecture.
- [The Religion of the Blind Watchmaker](#) (8.31.96)  
Reply to Stephen Jay Gould's 1992 *Scientific American* review of *Darwin on Trial*.
- [What \(If Anything\) Hath God Wrought?](#) (8.31.96)  
Published in the Sept/Oct 1995 issue of *Academe*, the official journal of the American Association of University Professors.
- [What is Darwinism?](#) (8.31.96)  
Paper originally delivered as a lecture at a symposium at Hillsdale College, in November 1992.

## Reviews

- [Daniel Dennett's Dangerous Idea](#) (8.31.96)  
Review of *Darwin's Dangerous Idea*, by Daniel Dennett, was published in *The New Criterion*, October, 1995.
- [The Extinction of Darwinism](#) (9.11.96)  
Review from *The Atlantic*, February, 1992.
- [The Fear of God](#) (4.7.99)  
Review of *The Fifth Miracle: The Search for the Origin of Life*, by Paul Davies (1999). A condensed version of this review essay was published in the *Weekly Standard* for March 22, 1999. This is the original manuscript version.
- [The Robot Rebellion of Richard Dawkins](#) (7.5.00)  
Review of Richard Dawkins' *Unweaving the Rainbow*. Reprinted from *Christian Research Journal*, June 14, 2000.

## Articles and Reviews from *Books & Culture*

- [Engaging the Third Culture](#) Sept/Oct 1995  
A review of *The Third Culture: Beyond the Scientific Revolution*, by John Brockman. John Brockman is a literary agent who represents many of the most famous scientist/authors of today. The "third culture" of his title consists of scientists who write books for the general public; Brockman thinks they have replaced humanists as the most important intellectuals of

modern culture.

- [\*\*The Law and Politics of Religious Freedom: A Revolution in the Making\*\*](#) Nov/Dec. 1995  
A joint review of two books: *Foreordained Failure: The Quest for a Constitutional Principle of Religious Freedom*, By Steven D. Smith (Oxford University Press 1995); and *Mere Creatures of the State? Education, Religion, and the Court*, by William Bentley Ball (Crisis Books 1995). Steven D. Smith is a professor of constitutional law; William Bentley Ball is a practicing lawyer who has represented religious groups in famous Supreme Court cases.
- [\*\*The Belief that Works Best\*\*](#) (published as "William James and the Sirens of Rationalism"). Jan/Feb 1996  
A review of Paul Jerome Croce, *Science and Religion in the Era of William James: The Eclipse of Certainty, 1820-1880*, (Vol.1: University of North Carolina Press, 1995). Croce is a professor of history; his book is about the beginnings of pragmatism in American philosophy in the wake of the Darwinian revolution.
- [\*\*Paul Feyerabend's Choice for Freedom\*\*](#) (published as "Wundergadfly"). March/April 1996  
A review of Paul Feyerabend's autobiography, *Killing Time*. Paul Feyerabend was a philosopher of science and a famous critic of the scientific imperialism promoted by the authors interviewed in the John Brockman collection (see #1, above).
- [\*\*Starting a Conversation about Evolution\*\*](#) (published as "Third Party Science"). May/June 1996.  
A review of *The Battle of the Beginnings: Why Neither Side is Winning the Creation-Evolution Debate*, by Del Ratzsch. Ratzsch is a professor of philosophy at Calvin College.
- [\*\*Left Behind\*\*](#) Sept/Oct 1996.  
A review of *The Twilight of Common Dreams: Why America is Wracked by Culture Wars*, by Todd Gitlin. Gitlin, a Berkeley sociologist who recently moved to New York University, was a founding member of what used to be called the "New Left."
- [\*\*Pomo Science\*\*](#) Nov/Dec 1996.  
A review of "Science Wars", a special issue of *Social Text* (Vol. 14, Nos. 1-2, 1996); and *The End of Science: Facing the Limits of Knowledge in the Twilight of the Scientific Age* by John Horgan. This review contrasts the rationalist and relativist approaches to science -- and to Biblical studies.
- [\*\*Harter's Precept\*\*](#) (published as "The Emperor's New Theories") March/April 1997.  
Critical Thinking applied to some prominent fallacies in social science.
- [\*\*Genius and Plod\*\*](#) May/June 1997.  
A joint review of Martin Gilbert's book about how he investigated all the fascinating details of Winston Churchill's life, and of Drusilla Scott's popular account of Michael Polanyi's thought.



- [The Law Written on the Heart](#) (Published as "Coercion and Conscience) July/August 1997.  
A review of J. Budziszewski's book about natural law.

#### Articles and Reviews from *First Things* Journal

- [Chapter and Verse: A Skeptic Revisits Christianity](#) (8.12.97)  
Review essay from *First Things*, December 1991.
- [Creator or Blind Watchmaker?](#) (11.2.98)  
Article from *First Things*, January 1993.
- [Evolution as Dogma: The Establishment of Naturalism](#) (2.01.00)  
Article published in *First Things*, October 1990, and reprinted by the *Foundation for Thought and Ethics*. Also includes [Responses of Critics to Phillip Johnson](#) and Phillip Johnson's [Reply to My Critics](#).
- [The Gorbachev of Darwinism](#) (3.23.99)  
Article from *First Things*, January 1998.
- [Nihilism and the End of the Law](#) (2.28.99)  
Article from *First Things*, March 1993.
- [The Storyteller and the Scientist](#) (1.11.97)  
Review essay from *First Things*, October 1996.
- [The Unraveling of Scientific Materialism](#) (12.12.97)  
Link to article from *First Things* 77, November 1997.
- [What Would Newton Do?](#) (2.28.99)  
Article from *First Things*, November 1998.

#### Biographical

- [Doubting Rationalist: " Intelligent Design" Proponent Phillip Johnson and How He Came to Be](#) (5.16.05)  
*Washington Post* interview by Michael Powell, May 15, 2005.
- [Interview with Christian Book Distributors](#) (8.20.00)  
Email interview from the week of August 14, 2000.
- [Johnson Challenges Advocates of Evolution](#) (2.5.00)  
Article from *Insight on the News*, October 1999. Profile and Interview with Phillip Johnson.
- [Communiqué Interview: Phillip E. Johnson](#) (4.9.99)  
Interview from Communiqué, Spring 1999.

[ [Previous Page](#) ] [ [Phillip Johnson Page](#) ] [ [ARN Home Page](#) ]

Copyright 2006 Access Research Network. All rights reserved. International copyright secured. The articles contained in this section are copyright protected individually by the author. Please refer to each article for specific copyright, reproduction, and usage limitations. A return link to the Access Research Network web site would be appreciated.

### **PBS Firing Line Debate on Creation/Evolution December 19, 1997**

William Buckley hosted a creation/evolution debate on the PBS show *Firing Line* 19 December 1997. The cast of debaters was impressive with four respected names representing each side. The debate was organized into a series of mini-debates, some one-on-one between two individuals, and some involving the whole group.

#### **Resolved: Evolution Should Acknowledge Creation**

**Moderator:** Michael Kinsley

#### **Debaters:**

##### **Pro (creationist):**

- **Mr. William F. Buckley**
- **Mr. Philip Johnson** (lawyer, author, *Darwin On Trial*)
- **Dr. Micheal Behe** (biochemist, author, *Darwin's Black Box*)
- **Dr. David Berlinski** mathematician, author, *The Deniable Darwin*)

##### **Con (evolutionist):**

- **Mr. Barry Lynne** (Americans for the Separation of Church and State)
- **Ms. Eugenie Scott** (Exec. Director, National Center for Science Education)
- **Dr. Michael Ruse** (philosopher)
- **Dr. Kenneth Miller** (biologist, author, reviewed *Darwin's Black Box*)

## Debate Resources

### Articles about the Debate

- **Surviving Darwinism** By Marla Freeman, Special to The Chronicle. *San Francisco Chronicle*, Friday, December 19, 1997, p.A 25
- **Christians and Scientists; New Light for Creationism** By Laurie Goodstein. [\*The New York Times\*](#), December 21, 1997, Sunday

### Television Review

- **Once Again, of God, Man And Everything in Between** By Walter Goodman. "New York Times Review of PBS Firing Line Debate on Creation/Evolution". [\*The New York Times\*](#), December 19, 1997, Friday, P. E 34

### Surviving Darwinism

#### By Marla Freeman

[freemanM@rosebud.berkeley.edu](mailto:freemanM@rosebud.berkeley.edu)  
*Special to The Chronicle*

University of California at Berkeley law professor Phillip Johnson enjoys taking on the theory of evolution ... even if it means swimming against the tide in a place not exactly known as a bastion for anti-Darwinist views.

He has written a new book, which has sold nearly 50,000 copies, aimed at giving parents and students material to counter Darwinism in the classroom and its close relative, modernism, in the culture.

Johnson's main gripe, which he pretty much keeps out of the classroom, is: Scientists "propagate (Darwinism) as fact to every schoolchild in the country when the doctrine goes way beyond the evidence."

Today, Johnson will take his case to the airwaves, when he debates Darwinism on PBS' "Firing Line" with Eugenie Scott, executive director of the National Center for Science Education.

For the 57-year-old Johnson, expressing his views is made easier by the fact that he's been teaching at the liberal university for more than 30 years and been part of "the established club."

Johnson, in fact, says he has been treated fairly and that his colleagues at the Boalt Law School are "broad, fair-minded people."

But this, after all, is Berkeley.

One of his former criminal-law students, 24-year-old Eric Wolff, says that when a group of Christian students at Boalt put up flyers about Johnson's speaking engagements, someone defaced them and tore them down.

"These same people, if you did that to their posters, you'd be some kind of hatemonger," said Wolff, describing himself as a political moderate who is not religious.

Johnson's central argument is that Darwinism rests on faulty logic and flawed evidence ... such as fossil records with gaping holes.

More important, he says, the theory is based on the philosophy of naturalism, which includes the assumption that the physical world is all that exists. Darwin, he notes, attributes "randomness" to the universe and, it troubles him, that in doing so, makes "purposeless" the only acceptable scientific explanation for existence.

Johnson is on friendly terms with this week's debate opponent, Eugenie Scott ... the two even went to lunch recently. But the congeniality ends when Darwinism comes up.

"His scientific errors are legion," says Scott, who holds a Ph.D. in physical anthropology.

According to Scott, Johnson uses terms like "theory" and "fact" as lawyers use them, not scientists. And, she says, Johnson is "dead in the water with the academic community" with his claims that evolution by biological descent didn't happen and that natural selection doesn't work.

Scott and Johnson do agree on one thing.

"Just as I don't want a fundamentalist teaching that God created the world in a science class," Scott says, "I don't want a philosophical materialist teaching students that there's no possibility that God created it."

Johnson says special-interest groups keep promoting Darwinism for their own benefit.

"Scientists want the public to accept a naturalistic picture of evolution because then they think the public will trust the scientific priesthood to solve all problems and will finance them," he said.

The media, he says, also are part of the problem.

"Reporters challenge the authority of generals, police chiefs, and elected officials, but if it's a representative of the scientific elite, they say 'yes, sir' and they report it that way."

Johnson is a Christian, although he doesn't hold to a literal six-day creation. He came to his faith when he was in his late 30s, and in 1987, began delving into books on Darwinism while he was on sabbatical in England.

"I decided to see whether God was just a part of human subjectivity and the imagination, as the educated world thinks," he said. He discovered that his critical mind, the same one he used to dissect criminal cases, was at home reading scientific theory.

"I found I knew a lot about it from my legal analysis and jurisprudence. I know how that thinking is done. How you give an impression of fair-minded consideration of things, but you've actually decided all the important questions in the definition of the term ... how you make assumptions and hide them."

He wrote his first book, *Darwin on Trial*, in 1992, and then followed it in 1995 with *Reason in the Balance*, an extension of his anti-Darwinism argument to law, education and the culture wars. His latest book is *Defeating Darwinism by Opening Minds* (Intervarsity, \$9.95).

Johnson said his faith and views rarely come up in the classroom but it's not something he hides.

"I talk about it in passing where subjects have concern or interest," he said. "I think many of them think it's rather odd, but I don't find people getting really upset."

Eric Wolff, Johnson's former student, said, "I think there are a lot of students at Boalt who know about him very vaguely, and I think they sort of come into his class with an ax to grind ... you know, they see him as a social conservative target so I think they come into class watching his every word, waiting to find some hint of oppressive speech."

Wolff concurred that Johnson doesn't talk about his views in class, but "he'll always point out some of the contradictions in the predominant liberal orthodoxies on certain issues."

Balance is something that Boalt needs, Wolff said. "You need a couple people who are going to sit in unorthodox camps. I think Phil Johnson is one of them."

Copyright © 1997 Marla Freeman. All rights reserved. International copyright secured.  
File Date: 12.23.97

[replica breitling breitling replica watches](#)

*The New York Times*, December 21, 1997, Sunday, Section 4; Page 1; Column 1; Week in Review Desk

## **Christians and Scientists: New Light for Creationism**

**By Laurie Goodstein**

**IN** a startling about-face, the National Association of Biology Teachers, which had long stood firm against religious fundamentalists who insisted that creationism be taught in public schools, recently excised two key words from its platform on teaching evolution.

"The diversity of life on earth," the group's platform used to read, "is the outcome of evolution: an unsupervised, impersonal, unpredictable, and natural process." Now the crucial words "unsupervised" and "impersonal" have been dropped. The revision is clearly designed to allow for the possibility that a Master Hand was at the helm.

This surprising change in creed for the nation's biology teachers is only one of many signs that the proponents of creationism, long stereotyped as anti-intellectual Bible-thumpers, have new allies and the hope of new credibility.

The old breed of creationists consists of Biblical literalists for whom Genesis is the ideal textbook. They believe that God created the Earth in six days a few thousand years ago a position hard to maintain in the face of carbon dating. Active in their cause, the most vocal among them are affiliated with marginal groups like the Institute for Creation Research and Answers in Genesis, and find their audiences in conservative evangelical churches and on Christian radio. And though they call their field "creation science," they have been met with ridicule by scientists, and with embarrassment by most evangelical Christian intellectuals.

The new creationists, however, are Christian intellectuals, and some of them are even scientists. They hold faculty positions not at Bible colleges but at public and secular universities. They do not dispute that the planet is ancient. But they are promoting the idea that living organisms and the universe are so impossibly complex that the only plausible conclusion is that an omniscient creator designed it all on purpose.

The concept of "intelligent design" is not new, and even predates Darwinism. But it is getting a hearing in all sorts of mainstream settings, from lecture halls to scholarly journals to a "Firing Line" debate airing this week on PBS. William F. Buckley Jr. (a Roman Catholic whose church last year issued a message from the Pope reiterating the basic Catholic approach that evolution and belief in God are compatible) argues, "A lot of monkeys turned loose over an infinite number of times could not, would not, reproduce Shakespeare." Propelling this Scopes redux is a cluster of energetic evangelical academics who have long been resentful that American academia gives religion no respect. In attacking evolution, some of them believe they are knocking out the keystone in the secular wall that they say rings America's universities.

The most unlikely of these respectable renegades is Phillip E. Johnson, who once clerked for the liberal Chief Justice Earl Warren and who now holds an endowed law school chair at the University of California at Berkeley.

### **An Entire Culture**

Since his conversion to evangelical Christianity at the age of 37, Mr. Johnson has written three books attacking evolution. He says he is aiming to challenge not merely the secularism of universities but of an entire culture that he says rests on the scientific assumption of "naturalism" -- the idea that the natural world has no supernatural supervision. To Mr. Johnson, evolution is the linchpin to the naturalistic world view because it presupposes that creation was a chance development that life could happen without God.

"Do you need a creator, a pre-existing intelligence to get the creating done? Science has taught us you don't. You can believe in the creator as an unnecessary add-on if you want, but the process proceeds by itself."

Mr. Johnson presents as exhibits A, B and C the names of scientists who acknowledge -- or boast -- that believing in evolution has logically led them to become atheists or agnostics. In his book *Reason in the Balance*, Mr. Johnson says this "scientific elite" are our modern priests and evolution our "creation myth."

In a recent poll of 1,000 scientists, 55 percent said they believed that "God had no part in the process" of evolution. But 40 percent said that while they believe in evolution, "God guided the process, including the creation of man." Mr. Johnson wants to convince these "theistic evolutionists," who include many religious leaders, that their straddling is untenable. Many believers find no contradiction between the idea of a creator and evolution. For them, it is not an either-or proposition.

The biology teachers changed their statement, said Wayne Carley, the association's executive director, "to avoid taking a religious position" that could offend believers. But he said the group firmly believed "there is no evidence of any creator having a hand in the origin of any species." For years, the teachers resisted demands to amend the statement. But Mr. Carley said they decided in October to change the platform after a well-reasoned request in a letter from two distinguished scholars: Huston Smith, professor emeritus of religion at Berkeley, and Alvin Plantinga, a philosopher of religion at the University of Notre Dame.

Another ally of Mr. Johnson is Michael Behe, a biochemist at Lehigh University who contends that the molecular machinery of cells is so complex and interdependent that this is proof of purposeful design. Mr. Behe's book, *Darwin's Black Box: The Biochemical Challenge to Evolution*, was chosen as 1997 Book of the Year by the evangelical monthly Christianity Today.

Entering the fray with a recent article in Commentary is David Berlinski, a philosopher, who asserts that after more than 140 years the Darwinists have failed to prove their case because major transitions are "missing from the fossil record."

These new creationists avoid one pitfall of their predecessors by not positing, at least publicly, the identity of the creator. "My decision is simply to put it off," Mr. Johnson said, "and I recommend that to others."

## **Mainstream Fire**

This triumvirate has been duly picked apart by mainstream scientists. Kenneth Miller, a biologist at Brown University, argued in the "Firing Line" debate that "the intelligent designer" was "incompetent, because everything the intelligent designer designed, with about one percent exceptions, has immediately become extinct."

Mr. Miller also skewered Mr. Behe's book in a recent review. But that the book was even reviewed is progress in Mr. Johnson's view: "This issue is getting into the mainstream. People realize they can deal with it the way they deal with other intellectual issues like whether socialism is a good thing. My goal is not so much to win the argument as to legitimate it as part of the dialogue."

The danger in the new creationism, says Eugenie C. Scott, executive director of the National Center for Science Education in El Cerrito, Calif., is that "there are a lot of students going to be leaving college thinking evolution is in crisis." With fewer and fewer high school teachers daring to teach evolution these days, Ms. Scott said, the scientists of the next generation "are in bad shape."

replica breitling breitling replica watches

*The New York Times*, December 19, 1997, Friday, P. E34

***Television Review:***

**Once Again, of God, Man and Everything in Between**

**By Walter Goodman**

The debaters on Sunday night's "Firing Line" take pains to avoid pitting Charles Darwin squarely against God. But for many Americans, that's what the debate -- "Resolved: The Evolutionists Should Acknowledge Creation" -- is all about, and religion slips in here, too.

William F. Buckley Jr., leading the creationist team, begs the audience to spurn "the dogma of evolution" and choose instead "a broader intelligence which makes way for a First Mover." Barry Lynn, the executive director of Americans United for Separation of Church and State and leader of the evolutionist team, says the dispute is between "the only logically coherent and useful explanation for the development of life" and "fundamentalist religious beliefs or discredited philosophical constructs or what we sometimes refer to as just plain nonsense."

The complications are in the details. Advocates on both sides come equipped with charts, drawings and even a mousetrap, which do not clarify matters for the moderator, Michael Kinsley, who interrupts to ask the debaters what they are talking about when they give forth with such creations as "micro-evolution," "irreducible complexity," "adaptive differential reproduction," "bushy sequence" and "the gravamen of your argument is the chordate."

Despite the fancy phrases, however, the attentive listener should be able to pick up the major lines of the dispute. The Darwinians say that discoveries of fossils make a powerful argument for the evolution of humankind. The anti-Darwinians say that the fossil record is far from conclusive and that other discoveries suggest strongly that life is the product of an intelligent designer. Some Darwinians say it is possible to believe in God without believing that He created the universe. Some anti-Darwinians say it is possible to doubt the theory of evolution without being a creationist.

That makes for a sporadically lively hour, if not one likely to change many opinions. Mr. Buckley takes exception to what he calls the evolutionists' tendency to "imperialize" the issue by not allowing creationist thought into the schools. He dismisses evolutionary theory as "materialist philosophy." Kenneth Miller, a professor of biology at Brown University, counters that any "intelligent designer" would have to be incompetent because almost everything such an entity designed has immediately become extinct.

Mr. Kinsley does not ask Mr. Buckley to intelligently define "stochastic," one of his contributions to the session. If you were wondering, not that it advances either side's argument, it means conjectural. Thus does language evolve.

***FIRING LINE DEBATE***



*Resolved: The Evolutionists Should Acknowledge Creation* PBS, Sunday night (Channel 13, New York, at 9)

*Warren Steibel, producer and director; George Kahookele, associate producer and assistant director; Mark Nix, production director.*

*WITH: William F. Buckley Jr., Barry Lynn, Kenneth Miller and Michael Kinsley, moderator.*

Copyright © 1997 Walter Goodman. All rights reserved. International copyright secured.  
File Date: 12.23.97

replica breitling breitling replica watches

Welcome to the Top Ten Scientific Problems with Biological and Chemical Evolution

[Casey Luskin](#)

January 2, 2015, 12:00 AM

**Editor's note:** This is Part 1 of a 10-part series based upon Casey Luskin's chapter, "[The Top Ten Scientific Problems with Biological and Chemical Evolution](#)," in the volume [More than Myth](#), edited by Paul Brown and Robert Stackpole (Chartwell Press, 2014). The full chapter can be found online [here](#). Other individual installments can be found here: [Problem 1](#), [Problem 2](#), [Problem 4](#), [Problem 5](#), [Problem 6](#), [Problem 7](#), [Problem 8](#), [Problem 9](#), [Problem 10](#).

"There are no weaknesses in the theory of evolution."<sup>1</sup> So said Eugenie Scott, the de facto head of the Darwin lobby, while speaking to the media in response to the Texas State Board of Education's 2009 vote to require students to learn about both the scientific evidence for and against neo-Darwinian evolution.

For those who follow the debate over origins, Dr. Scott's words are as unsurprising as they are familiar. It seems that almost on a daily basis, we find the news media quoting evolutionary scientists declaring that materialist accounts of biological and chemical evolution are "fact." Students who take college-preparatory or college-level courses on evolution are warned that doubting Darwinism is tantamount to committing intellectual suicide — you might as well proclaim the Earth is flat.<sup>2</sup> Such bullying is enough to convince many that it's much easier on your academic standing, your career, and your reputation to just buy into Darwinism. The few holdouts who remain are intimidated into silence.

But is it true that there are "no weaknesses" in evolutionary theory? Are those who express doubts about Darwinism displaying courage, or are they fools that want to take us back to the dark ages and era of the flat Earth?<sup>3</sup> Thankfully, it's very easy to test these questions: all one must do is examine the technical scientific literature and inquire whether there are legitimate scientific challenges to chemical and biological evolution.

This chapter will review some of this literature, and show that there are numerous legitimate scientific challenges to core tenets of Darwinian theory, as well as predominant theories of chemical evolution. Those who harbor doubts about Darwinism need not be terrified by academic bullies who pretend there is no scientific debate to be had.

### **Problem 1: No Viable Mechanism to Generate a Primordial Soup**

According to conventional thinking among origin of life theorists, life arose via unguided chemical reactions on the early Earth some 3 to 4 billion years ago. Most theorists believe that there were many steps involved in the origin of life, but the very first step would have involved the production of a primordial soup — a water-based sea of simple organic molecules — out of which life arose. While the existence of this “soup” has been accepted as unquestioned fact for decades, this first step in most origin-of-life theories faces numerous scientific difficulties.

In 1953, a graduate student at the University of Chicago named Stanley Miller, along with his faculty advisor Harold Urey, performed experiments hoping to produce the building blocks of life under natural conditions on the early Earth.<sup>4</sup> These “Miller-Urey experiments” intended to simulate lightning striking the gasses in the early Earth’s atmosphere. After running the experiments and letting the chemical products sit for a period of time, Miller discovered that amino acids — the building blocks of proteins — had been produced.

For decades, these experiments have been hailed as a demonstration that the “building blocks” of life could have arisen under natural, realistic Earthlike conditions,<sup>5</sup> corroborating the primordial soup hypothesis. However, it has also been known for decades that the Earth’s early atmosphere was fundamentally different from the gasses used by Miller and Urey.

The atmosphere used in the Miller-Urey experiments was primarily composed of reducing gasses like methane, ammonia, and high levels of hydrogen. Geochemists now believe that the atmosphere of the early Earth did not contain appreciable amounts of these components. (Reducing gasses are those which tend to donate electrons during chemical reactions.) UC Santa Cruz origin-of-life theorist David Deamer explains this in the journal *Microbiology & Molecular Biology Reviews*:

*This optimistic picture began to change in the late 1970s, when it became increasingly clear that the early atmosphere was probably volcanic in origin and composition, composed largely of carbon dioxide and nitrogen rather than the mixture of reducing gases assumed by the Miller-Urey model. Carbon dioxide does not support the rich array of synthetic pathways leading to possible monomers...*<sup>6</sup>

Likewise, an article in the journal *Science* stated: “Miller and Urey relied on a ‘reducing’ atmosphere, a condition in which molecules are fat with hydrogen atoms. As Miller showed later, he could not make organics in an ‘oxidizing’ atmosphere.”<sup>7</sup> The article put it bluntly: “the early atmosphere looked nothing like the Miller-Urey situation.”<sup>8</sup> Consistent with this, geological studies have not uncovered evidence that a primordial soup once existed.<sup>9</sup>

There are good reasons to understand why the Earth’s early atmosphere did not contain high concentrations of methane, ammonia, or other reducing gasses. The earth’s early atmosphere is thought to have been produced by outgassing from volcanoes, and the composition of those volcanic gasses is related to the chemical properties of the Earth’s inner mantle. Geochemical studies have found that the chemical properties of the Earth’s mantle would have been the same in the past as they are today.<sup>10</sup> But today, volcanic gasses do not contain methane or ammonia, and are not reducing.

A paper in *Earth and Planetary Science Letters* found that the chemical properties of the Earth’s interior have been essentially constant over Earth’s history, leading to the conclusion

that “Life may have found its origins in other environments or by other mechanisms.”<sup>11</sup> So drastic is the evidence against pre-biotic synthesis of life’s building blocks that in 1990 the Space Studies Board of the National Research Council recommended that origin of life investigators undertake a “reexamination of biological monomer synthesis under primitive Earthlike environments, as revealed in current models of the early Earth.”<sup>12</sup>

Because of these difficulties, some leading theorists have abandoned the Miller-Urey experiment and the “primordial soup” theory it is claimed to support. In 2010, University College London biochemist Nick Lane stated the primordial soup theory “doesn’t hold water” and is “past its expiration date.”<sup>13</sup> Instead, he proposes that life arose in undersea hydrothermal vents. But both the hydrothermal vent and primordial soup hypotheses face another major problem.

### **Chemical Evolution Is Dead in the Water**

Assume for a moment that there was some way to produce simple organic molecules on the early Earth. Perhaps they did form a “primordial soup,” or perhaps these molecules arose near some hydrothermal vent. Either way, origin of life theorists must then explain how amino acids or other key organic molecules linked up to form long chains (polymers) like proteins (or RNA).

Chemically speaking, however, the last place you’d want to link amino acids into chains would be a vast water-based environment like the “primordial soup” or underwater near a hydrothermal vent. As the National Academy of Sciences acknowledges, “Two amino acids do not spontaneously join in water. Rather, the opposite reaction is thermodynamically favored.”<sup>14</sup> In other words, water breaks protein chains back down into amino acids (or other constituents), making it very difficult to produce proteins (or other polymers) in the primordial soup.

Materialists lack good explanations for these first, simple steps which are necessary to the origin-of-life. Chemical evolution is literally dead in the water.

### **References:**

[1.] Eugenie Scott, quoted in Terrence Stutz, “State Board of Education debates evolution curriculum,” *Dallas Morning News* (January 22, 2009), also requoted in Ed Stoddard, “Evolution gets added boost in Texas schools,” Reuters.com at <http://blogs.reuters.com/faithworld/2009/01/23/evolution-gets-added-boost-in-texas-schools/>

[2.] Karl W. Giberson, *Saving Darwin: How to be a Christian and Believe in Evolution*, p. 53 (HarperOne, 2008) (“biologists today consider the common ancestry of all life a fact on par with the sphericity of the earth”).

[3.] In any case, it’s largely a myth that Western Civilization once believed in a flat earth. See Jeffrey Burton Russell, “The Myth of the Flat Earth,” at <http://www.veritas-ucsb.org/library/russell/FlatEarth.html>

[4.] See Stanley L. Miller, “A Production of Amino Acids under Possible Primitive Earth Conditions,” *Science*, 117: 528-529 (May 15, 1953).

[5.] See Jonathan Wells, *Icons of Evolution: Why Much of What We Teach About Evolution Is Wrong*, (Washington D.C.: Regnery, 2000); Casey Luskin, “Not Making the Grade: An Evaluation of 19 Recent Biology Textbooks and Their Use of Selected Icons of Evolution,” Discovery Institute (September 26, 2011), at [https://evolutionnews.wpengine.com/DiscoveryInstitute\\_2011TextbookReview.pdf](https://evolutionnews.wpengine.com/DiscoveryInstitute_2011TextbookReview.pdf)

- [6.] David W. Deamer, "The First Living Systems: a Bioenergetic Perspective," *Microbiology & Molecular Biology Reviews*, 61:239 (1997).
- [7.] Jon Cohen, "Novel Center Seeks to Add Spark to Origins of Life," *Science*, 270: 1925-1926 (December 22, 1995).
- [8.] Ibid.
- [9.] Antonio C. Lasaga, H. D. Holland, and Michael J. Dwyer, "Primordial Oil Slick," *Science*, 174: 53-55 (October 1, 1971).
- [10.] Kevin Zahnle, Laura Schaefer, and Bruce Fegley, "Earth's Earliest Atmospheres," *Cold Spring Harbor Perspectives in Biology*, 2(10): a004895 (October, 2010) ("Geochemical evidence in Earth's oldest igneous rocks indicates that the redox state of the Earth's mantle has not changed over the past 3.8 Gyr"); Dante Canil, "Vanadian in peridotites, mantle redox and tectonic environments: Archean to present," *Earth and Planetary Science Letters*, 195:75-90 (2002).
- [11.] Dante Canil, "Vanadian in peridotites, mantle redox and tectonic environments: Archean to present," *Earth and Planetary Science Letters*, 195:75-90 (2002) (internal citations removed).
- [12.] National Research Council Space Studies Board, *The Search for Life's Origins* (National Academy Press, 1990).
- [13.] Deborah Kelley, "Is It Time To Throw Out 'Primordial Soup' Theory?," NPR (February 7, 2010).
- [14.] Committee on the Limits of Organic Life in Planetary Systems, Committee on the Origins and Evolution of Life, National Research Council, *The Limits of Organic Life in Planetary Systems*, p. 60 (Washington D.C.: National Academy Press, 2007).

"Live Not by Lies": Aleksandr Solzhenitsyn and Intelligent Design

Michael Egnor

July 15, 2020, 1:22 PM

Photo: Aleksandr Solzhenitsyn, by Verhoeff, Bert / Anefo / CC0.

I got involved in the intelligent design movement before I became a Christian, although the insight that ID offered became important in my conversion. I had been an atheist, or at least an agnostic. I took a Randian (as in Ayn Rand) perspective on religion: religion was just another form of rent-seeking for priests, a way of making a living by plying a lie.

I thought God didn't exist, not because I had worked out the arguments and came to that conclusion (like most atheists I understood virtually nothing about the real arguments), but because, as Laplace reportedly said to Napoleon about God, "I have no need of that hypothesis." Life was in need of explanation, and Darwin provided it. Man, and all living things, evolved by variation and selection, from some primordial accident of chemicals. Science had proven this, I thought, so why waste my time in a church pew?

How Good Science Behaves?

Two things drew me into ID. First, I was aghast at the treatment of ID theorists and other skeptics by Darwinists. I believed in Darwinism, but goodness gracious Darwinists were nasty. It didn't seem to me like good science: my beloved mentor, biologist Bob Pollack with

whom I did research in college, said: “A good scientist is always *his own* most exacting critic.” Darwinists spent their time excoriating IDers, and seemed to care little for genuine critiques of their own science. I thought: if Darwinism is good science (as I thought it was), Darwinists should welcome public debate and engage honest discussion. After all, if they had the facts, what is there to fear? But instead, they *Expelled* anyone who questioned Darwinism. They insulted people, intimidated them, used *the courts* to silence them, and callously ruined their careers. This was Lysenkoism, not science.

Second, I had the good fortune to read ID pioneers: Phillip Johnson, Michael Denton, Richard Sternberg, Jonathan Wells, Michael Behe, William Dembski, among others. They made sense. A *lot* of sense. So, over time, I embraced ID. I even used ID in my own research, applying engineering principles to understand blood flow in the brain. It is good science, honest science. Real science.

In my own career, my embrace of ID has had little negative effect. I got promoted and got tenure and I advanced in my career without Darwinist hinderance. They tried — there have been many calls to my university demanding that I be fired, and I’ve had death threats. But I have done fine, due to the integrity and good nature of my bosses and the fact that I have a day job that doesn’t depend on Darwinists’ opinions of me. Not so for many of my colleagues in the ID community, who depend on grants and on academic decisions made by Darwinists, and who have suffered greatly. The ID folks who have sacrificed careers and withstood public excoriation and even judicial attack to tell the truth about design in nature are heroes, plain and simple.

### Cancel Culture

I’ve watched current events, especially “cancel culture,” with interest and with an unsettling sense of familiarity. The film [Expelled](#) is, after all, a documentary about professional “cancellation,” a decade or so before cancellation in America went viral. It is as if the Darwinist assault on ID was a run-up to the contemporary massive assault on intellectual freedom. Dissenters are denigrated, slandered, excluded, and fired for expressing opinions that just a few years ago were widely expressed and often still represent majority opinion. The Darwinist trope that criticism of Darwinist theory is “anti-science” is the prologue to the woke mob’s trope that free speech is a kind of “violence.” It’s the same segue — the Darwinist/cancel culture mob’s response to reasoned discourse is “Nice career you’ve got there — shame if something happened to it.”

There is, obviously, a totalitarian flavor to all of this, and (remarkably) it is imposed on us *by us*. We’re doing this to ourselves. No Bolshevik faction has stormed Washington and occupied the White House and commandeered the army. We have chosen to expel/cancel *ourselves*.

So how do those of us who cherish scientific integrity and the human rights endowed by the Lord and enumerated in our Constitution stand up for academic freedom and freedom of speech in these times?

### “Live Not by Lies”

Recently, on reading Aleksandr Solzhenitsyn’s short essay “Live Not by Lies,” I was struck by the analogy between the totalitarian system Solzhenitsyn faced, the Lysenkoism of the

Darwinist suppression of ID, and the “woke” assault on freedom of speech and freedom of thought spreading like fire through our nation. Solzhenitsyn writes:

*At one time we dared not even to whisper. Now we write and read samizdat, and sometimes when we gather... we complain frankly to one another: What kind of tricks are they playing on us, and where are they dragging us? Is there any way out? And they put on trial anybody they want and they put sane people in asylums — always they, and we are powerless... what can we do to stop it?*

The parallels are obvious. If you doubted the Soviet system, or doubt Darwinism, or if you doubt any of the tropes currently on tap in the woke-sphere, you do well to keep silent, if you value your reputation and your career, and, increasingly, if you value your personal safety.

*... for today's modest ration of food we are willing to abandon all our principles, our souls, and all the efforts of our predecessors and all opportunities for our descendants — but just don't disturb our fragile existence. We lack staunchness, pride and enthusiasm... We have already taken refuge in the crevices. We just fear acts of civil courage. We fear only to lag behind the herd and to take a step alone — and suddenly find ourselves without white bread, without heating gas and without a Moscow registration.*

### The Wrong Side of the Mob

And so we fear to speak out for scientific integrity or freedom of speech lest we find ourselves on the wrong side of the mob or as pariahs without a career or a business.

Survival in the scientific profession, and (increasingly) survival in the social, economic, and political realm depends on accepting a very specific kind of dogma. Solzhenitsyn:

*We have been indoctrinated in political courses, and in just the same way was fostered the idea to live comfortably, and all will be well for the rest of our lives...*

If we take a knee — if we pay homage to Darwinian stories or accede to the mob — we can get on with our lives, even prosper. But at the price of our minds and our souls.

*The circle — is it closed? And is there really no way out? And is there only one thing left for us to do, to wait without taking action? Maybe something will happen by itself? It will never happen as long as we daily acknowledge, extol, and strengthen — and do not sever ourselves from the most perceptible of its aspects: Lies.*

### Our Lives, Our Lies

Solzhenitsyn explains the essential role that *our lies* play in enforcing conformity:

*When violence intrudes into peaceful life, its face glows with self-confidence, as if it were carrying a banner and shouting: “I am violence. Run away, make way for me — I will crush you.” But violence quickly grows old. And it has lost confidence in itself, and in order to maintain a respectable face it summons falsehood as its ally — since violence lays its ponderous paw not every day and not on every shoulder. It demands from us only obedience to lies and daily participation in lies — all loyalty lies in that.*



The use of force to enforce conformity is limited: it cannot be sustained. Darwinists can't spend all their time destroying colleagues' careers. Mobs can't fill the streets day and night. Cancellers depend on *your* complicity. They depend on *you* to lie. With this insight — the fundamental insight by which we can fight cancel culture in the lab and the classroom and in the world — Solzhenitsyn sees how each of us can fight the censors.

*And the simplest and most accessible key to our self-neglected liberation lies right here: Personal non-participation in lies. Though lies conceal everything, though lies embrace everything, but not with any help from me. This opens a breach in the imaginary encirclement caused by our inaction. It is the easiest thing to do for us, but the most devastating for the lies. Because when people renounce lies it simply cuts short their existence. Like an infection, they can exist only in a living organism.*

### Our Personal Participation

Darwinist (and other) censors depend on our personal participation in lies to silence us, and this provides us with a weapon they cannot counter: personal non-participation in lies, a kind of civil disobedience.

*[L]et us refuse to say that which we do not think... we [will] be astonished how quickly the lies would be rendered helpless and subside.*

Solzhenitsyn recommends a series of acts of non-participation: we refuse to write or endorse or speak any statement in science or ethics or politics that is untrue. We refuse to be compelled to attend meetings or activities if they are contrary to truth. We will walk out of meetings in which lies are promulgated. We will only read and endorse literature that advances truth.

Solzhenitsyn has no illusions about the difficulty and potential consequences of non-participation in lies.

*Some, at first, will lose their jobs. For young people who want to live with truth, this will, in the beginning, complicate their young lives very much, because the required recitations are stuffed with lies, and it is necessary to make a choice. But there are no loopholes for anybody who wants to be honest. On any given day any one of us will be confronted with at least one of the above-mentioned choices even in the most secure of the technical sciences. Either truth or falsehood: Toward spiritual independence or toward spiritual servitude... It will not be an easy choice for a body, but it is the only one for a soul.*

Even this non-participation in lies will be very difficult, but it is a powerful kind of resistance.

*So you will not be the first to take this path, but will join those who have already taken it. This path will be easier and shorter for all of us if we take it by mutual efforts and in close rank. If there are thousands of us, they will not be able to do anything with us. If there are tens of thousands of us, then we would not even recognize our country.*

If you can, fight scientific censorship and cancel culture actively — by speaking out, by writing, by activism. Do ID research. Support Discovery Institute. But if you are in a position

in which you cannot actively resist — if because of your family or your circumstances you cannot risk your livelihood — you can quietly resolve not to participate in lies.

They're Terrified of Ridicule

The censors depend on active personal destruction not to silence us, but to get us (out of fear) to lie and thus silence ourselves. Their power is not in their violence but in our complicity.

Don't be complicit. Don't participate. Don't give assent to Darwinist or atheist or Marxist lies. If you're a teacher, let your students know (implicitly if you cannot do so explicitly) that the Darwinism you are forced to teach is not, as the censors insist, a perfect doctrine with strengths only and no weaknesses. If you are a scientist, don't include nonsensical Darwinist tropes in your publications or even in your conversations. When others tell Darwinian fairytales, if you are not in a position to openly reply, a quip or a joke (they're terrified of ridicule) or just a smirk or rolled eyes is resistance. You can always just walk away.

Censors of all sorts depend on the cooperation of their victims. Don't cooperate. Don't participate. Serve only the truth. Live not by lies.

[https://evolutionnews.org/2015/01/the\\_top\\_ten\\_sci/](https://evolutionnews.org/2015/01/the_top_ten_sci/)

## **The Church of Darwin**

Phillip E. Johnson

This article is reprinted from the *Wall Street Journal*, August 16, 1999.

A Chinese paleontologist lectures around the world saying that recent fossil finds in his country are inconsistent with the Darwinian theory of evolution. His reason: The major animal groups appear abruptly in the rocks over a relatively short time, rather than evolving gradually from a common ancestor as Darwin's theory predicts. When this conclusion upsets American scientists, he wryly comments: "In China we can criticize Darwin but not the government. In America you can criticize the government but not Darwin."

That point was illustrated last week by the media firestorm that followed the Kansas Board of Education's vote to omit macro-evolution from the list of science topics which all students are expected to master. Frantic scientists and educators warned that Kansas students would no longer be able to succeed in college or graduate school, and that the future of science itself was in danger. The *New York Times* called for a vigorous counteroffensive, and the lawyers prepared their lawsuits. Obviously, the cognitive elites are worried about something a lot more important to themselves than the career prospects of Kansas high school graduates.

The root of the problem is that "science" has two distinct definitions in our culture. On the one hand, science refers to a method of investigation involving things like careful measurements, repeatable experiments, and especially a skeptical, open-minded attitude that insists that all claims be carefully tested. Science also has become identified with a philosophy known as materialism or scientific naturalism. This philosophy insists that nature is all there is, or at least the only thing about which we can have any knowledge. It follows



that nature had to do its own creating, and that the means of creation must not have included any role for God. Students are not supposed to approach this philosophy with open-minded skepticism, but to believe it on faith.

The reason the theory of evolution is so controversial is that it is the main scientific prop for scientific naturalism. Students first learn that "evolution is a fact," and then they gradually learn more and more about what that "fact" means. It means that all living things are the product of mindless material forces such as chemical laws, natural selection, and random variation. So God is totally out of the picture, and humans (like everything else) are the accidental product of a purposeless universe. Do you wonder why a lot of people suspect that these claims go far beyond the available evidence?

All the most prominent Darwinists proclaim naturalistic philosophy when they think it safe to do so. Carl Sagan had nothing but contempt for those who deny that humans and all other species "arose by blind physical and chemical forces over eons from slime." Richard Dawkins exults that Darwin "made it possible to be an intellectually fulfilled atheist," and Richard Lewontin has written that scientists must stick to philosophical materialism regardless of the evidence, because "we cannot allow a Divine Foot in the door." Stephen Jay Gould condescendingly offers to allow religious people to express their subjective opinions about morals, provided they don't interfere with the authority of scientists to determine the "facts" -- one of the facts being that God is merely a comforting myth.

There are a lot of potential dissenters. Sagan deplored the fact that "only nine percent of Americans accept the central finding of biology that human beings (and all the other species) have slowly evolved from more ancient beings with no divine intervention along the way." To keep the other 91% quiet, organizations like the National Academy of Sciences periodically issue statements about public school teaching which contain vague reassurances that "religion and science are separate realms," or that evolutionary science is consistent with unspecified "religious beliefs."

What these statements mean is that the realms are separate because science discovers facts and religion indulges fantasy. The acceptable religious beliefs they have in mind are of the naturalistic kind that do not include a supernatural creator who might interfere with evolution or try to direct it. A great many of the people who do believe in such a creator have figured this out, and in consequence the reassurances merely insult their intelligence.

So one reason the science educators panic at the first sign of public rebellion is that they fear exposure of the implicit religious content in what they are teaching. An even more compelling reason for keeping the lid on public discussion is that the official neo-Darwinian theory is having serious trouble with the evidence. This is covered over with the vague claim that all scientists agree that "evolution has occurred." Since the Darwinists sometimes define evolution merely as "change," and lump minor variation with the whole creation story as "evolution," a few trivial examples like dog-breeding or fruit fly variation allow them to claim proof for the whole system. The really important claim of the theory -- that the Darwinian mechanism does away with the need to presuppose a creator -- is protected by a semantic defense-in-depth.

Here's just one example of how real science is replaced by flim-flam. The standard textbook example of natural selection involves a species of finches in the Galapagos, whose beaks have been measured over many years. In 1977 a drought killed most of the finches, and the

survivors had beaks slightly larger than before. The probable explanation was that larger-beaked birds had an advantage in eating the last tough seeds that remained. A few years later there was a flood, and after that the beak size went back to normal. Nothing new had appeared, and there was no directional change of any kind. Nonetheless, that is the most impressive example of natural selection at work that the Darwinists have been able to find after nearly a century and a half of searching.

To make the story look better, the National Academy of Sciences removed some facts in its 1998 booklet on *Teaching About Evolution and the Nature of Science*. This version omits the flood year return-to-normal and encourages teachers to speculate that a "new species of finch" might arise in 200 years if the initial trend towards increased beak size continued indefinitely. When our leading scientists have to resort to the sort of distortion that would land a stock promoter in jail, you know they are in trouble.

If the Academy meant to teach scientific investigation, rather than to inculcate a belief system, it would encourage students to think about why, if natural selection has been continuously active in creating, the observed examples involve very limited back-and-forth variation that doesn't seem to be going anywhere. But skepticism of that kind might spread and threaten the whole system of naturalistic belief. Why is the fossil record overall so difficult to reconcile with the steady process of gradual transformation predicted by the neo-Darwinian theory? How would the theory fare if we did not assume at the start that nature had to do its own creating, so a naturalistic creation mechanism simply has to exist regardless of the evidence? These are the kinds of questions the Darwinists don't want to encourage students to ask.

This doesn't mean that students in Kansas or elsewhere shouldn't be taught about evolution. In context, the Kansas action was a protest against enshrining a particular worldview as a scientific fact and against making "evolution" an exception to the usual American tradition that the people have a right to disagree with the experts. Take evolution away from the worldview promoters and return it to the real scientific investigators, and a chronic social conflict will become an exciting intellectual adventure.

*Mr. Johnson is professor of law at the University of California, Berkeley, and the author of Darwin on Trial (Intervarsity Press, 1993).*

Copyright 1999 Dow Jones & Company, Inc. All rights reserved. International copyright secured.

File Date: 8.27.99

## **News and Commentary**

### **Origins & Design 17:2**

#### **Data, Theory, and Evolutionary Phenomena**

**James R. Hofmann**

Philosophy Department

California State University Fullerton

Fullerton, CA 92634

## **Fact and Theory**

Disagreements between creationists and evolutionary theorists have directed attention to a wide variety of issues that deserve philosophical scrutiny. In particular, in legal and educational contexts, the creation/evolution debate has contributed to a widespread uncertainty about whether to depict evolution as "fact" or "theory," or perhaps as both. I propose that a distinction between data and phenomena can clarify how, depending upon context, the term "evolution" can refer either to a complex fact or to an explanatory theory.

Examples of the dispute are easy to find. Both the 1981 Arkansas and 1986 Louisiana "balanced treatment" bills included references to the allegedly nonfactual nature of evolution. The Arkansas bill stated as one of its Legislative findings of fact that:

Evolution-science is not an unquestionable fact of science, because evolution cannot be experimentally observed, fully verified, or logically falsified, and because evolution-science is not accepted by some scientists.

Michael Ruse was the well known philosopher of science called upon to testify during the trial that eventually rendered the Arkansas bill unconstitutional. In his 1982 *Darwinism Defended* he tried to be charitable, but before too many pages he was pounding on his keyboard, shrieking that "Evolution is a fact, fact, FACT!"<sup>1</sup>

The analogous 1986 Louisiana balanced treatment bill required that both "creation-science" and "evolution-science" be taught as theory rather than "proven scientific fact." In response, the "Friends of the Court" brief drawn up in the name of 72 Nobel Laureates prior to the 1987 Supreme Court decision pooh-poohed this demand by claiming that:

To a scientist or a science educator, the distinction between scientific theories and scientific facts is well understood. A "fact" is a property of a natural phenomenon. A "theory" is a naturalistic explanation for a body of facts.<sup>2</sup>

Similar comments followed a few pages later:

Every scientific discipline embraces a body of facts and one or more theories to explain them. Significantly for this case, scientific facts and theories are not interchangeable: an explanatory principle is not to be confused with the data it seeks to explain. This relationship between scientific theory and fact permeates all scientific disciplines; it unifies the enterprise of all scientists, from astronomers to zoologists.<sup>3</sup>

Although the Supreme Court ruled in favor of the scientific establishment by declaring the Louisiana bill unconstitutional, Justice Scalia (with the approval of Rehnquist) dissented. "The people of Louisiana," he wrote, "... are quite entitled, as a secular matter, to have whatever scientific evidence there may be against evolution presented in their schools, just as Mr. Scopes was entitled to present whatever scientific evidence there was for it."<sup>4</sup>

At the heart of the dissent lay Scalia's bluntly expressed view that reasonable persons could disagree over the merits of evolution:

Infinitely less can we say (or should we say) that the scientific evidence for evolution is so conclusive tht no one would be gullable enough to believe that there is any real scientific evidence to the contrary....5

In other words, Scalia argued, evolution was open to rational dispute. It could not claim the status of a "fact" beyond all scientific disagreement.

Stephen Jay Gould has vigorously vented his frustration with this attitude. In his 1981 "Evolution as Fact and Theory" he wrote that:

Well, evolution is a theory. It is also a fact. And facts and theories are different things, not rungs in a hierarchy of increasing certainty. Facts are the world's data. Theories are structures of ideas that explain and interpret facts. Facts do not go away while scientists debate rival theories for explaining them. Einstein's theory of gravitation replaced Newton's, but apples did not suspend themselves in mid-air pending the outcome. And human beings evolved from apelike ancestors whether they did so by Darwin's proposed mechanism or by some other, yet to be discovered.6

On this account, Darwin, instead of writing that the Origin was "one long argument," should have described it as "two long arguments": one for the fact of evolution and one for Darwin's explanatory theory. Gould likes to quote a famous passage from Darwin's *The Descent of Man* to demonstrate that Darwin fully understood the distinction between the evolutionary fact he called "descent with modification" and his explanatory theory primarily based upon natural selection. But this distinction certainly does not stand out in Desmond and Moore's recent marvelous biography of Darwin. Their description of Thomas Huxley's disagreements with Darwin never crystallize around this issue, at least on my reading.

Be this as it may, the evolution of humans from apelike ancestors clearly is not a "fact" of the same simplicity as a falling apple, and Gould's analogy is unconvincing for that reason. For example, according to a November 1989 California Board of Education committee decision, the state's guideline for scientific textbooks does not refer to evolution as a "scientific fact;" the appropriate term is thought to be "theory." More recently, Philip Johnson in his *Darwin on Trial* had the following comment on Gould's analogy between falling apples and evolving humans:

The analogy is spurious. We observe directly that apples fall when dropped, but we do not observe a common ancestor for modern apes and humans. What we do observe is that apes and humans are physically and biochemically more like each other than they are like rabbits, snakes or trees. The ape-like common ancestor is a hypothesis in a theory, which purports to explain how these greater and lessor similarities came about.

... The "fact" that Gould describes is therefore nothing but Darwin's theory rightly understood: evolution is descent with modification propelled by random genetic changes, with natural selection providing whatever guidance is needed to produce complex adaptive structures like wings and eyes.7

Johnson clearly exaggerates the degree to which theoretical assumptions infiltrate the statement that evolution is a "fact;" he wants to convince his readers not only that the term "evolution" includes a dogmatic commitment to the power of natural selection, but also that in educational practice it means an allegiance to philosophical materialism and atheism. But

without buying into Johnson's full agenda, we can at least acknowledge that he does properly call attention to the intriguing ambiguity of the phrase "descent with modification." How much theoretical baggage was or is smuggled in under Darwin's seemingly innocent phrase?

At this point it is appropriate to ask whether there are some philosophical distinctions at hand to help clarify matters. With due regard for Michael Ruse's rash reliance on falsificationism during the Arkansas balanced treatment trial, it seems that at least one philosophical contribution would be useful: the distinction between data and phenomena.

### **Data and Phenomena**

In several recent publications, James Bogen and James Woodward have pointed out the detrimental effects of relying upon the traditional philosophical dichotomy of theory and observation.<sup>8</sup> They advocate a distinction between "data" and "phenomena" based upon two distinct phases in scientific reasoning. Bluntly stated, data provide evidence for the phenomena that theories explain. Data are highly idiosyncratic with respect to experimental equipment, materials and conditions, factors which are not addressed by theoretical formalism. Furthermore, attempts to replicate experimental procedures result in data with values that vary over an appreciable range; the complexity of the causal factors in any interesting experiment make it impossible to explain the exact data resulting from any specific trial. Experimental data, with all their complexity, thus are never actually explained by theory. Instead, data provide evidence for the existence of phenomena. Phenomena are inferred from data and have a stability that can be detected by means of a variety of different types of data. Both data and phenomena can be accepted as scientific facts.

Nevertheless, phenomena are far more complex facts than data are. While data are the more or less direct result of experimental observation and measurement, phenomena must be inferred from these data and cannot be straightforwardly observed.

Some relevant examples would be the phenomena described by Kepler's laws of planetary motion. That planets sweep out equal areas in equal periods of time in elliptic solar orbits for which the square of the period is proportional to the cube of the average radius are phenomena that Kepler managed to infer from extensive planetary data. Although these phenomena are certainly recognized as scientific "facts", they cannot be directly observed. Similarly, Galileo's law of falling bodies [ $d = \frac{1}{2}gt^2$ ] is a phenomenological law, a phenomenon Galileo inferred from relevant data: his measurements of height and time for balls rolling down inclined planes. Both Kepler's and Galileo's phenomena were initially explained by the application of Newton's laws of motion and his law of gravitation to an idealized representation of the relevant masses.

On the other hand, to note a less successful example, in a celebrated 1989 case, the alleged phenomenon of "cold fusion" was found to be nonexistent in spite of a considerable accumulation of data. Although Pons and Fleishman claimed to have evidence in support of the phenomenon of nuclear fusion at room temperature, their claim was subsequently rejected due to the assessment of their data as idiosyncratic artifacts of experimental equipment. Some of the data continues to be of interest, but by the end of 1989 efforts to give theoretical explanations for the phenomenon of cold fusion had been judged premature.

With these examples in mind, the Bogen/Woodward distinction at least implicitly sets up a three-level explanatory and evidential hierarchy: data, phenomena and explanatory theory.

Now, granted that these distinctions are valuable in the physical sciences, the biological sciences are notoriously hierarchical in ways that make the simple triad of data, phenomena, and theory look immediately simplistic. Nevertheless, I would argue that it can at least improve upon the present level of the discussion of evolution as "fact or theory." Gould's discussion is unconvincing because he relies on an analogy between evolution and gravity that essentially involves a category mistake. The "fact" that is explained by Newtonian theory is Galileo's phenomenological law of falling bodies, a phenomenon inferred from data accumulated through measurements of rolling balls, if not falling apples. I will argue that Gould's analogy should be of the form: gravitational phenomena are to Newton's theory of gravitation as evolutionary phenomena are to Darwin's theory of evolution.

Although as a first approximation it is tempting to propose that the "fact" of evolution is a complex fact in the sense that it is a phenomenon inferred from simpler data, it is not clear how this alleged phenomenon should be characterized. In *Of Pandas and People*, a controversial high school textbook, intelligent design advocates Mark Hartwig and Stephen Meyer follow Keith Thomson's argument that the term "evolution" can be used to refer to at least three distinct processes: biological change over time, descent with modification, and descent modified exclusively by random variation and natural selection.<sup>9</sup>

If it is insisted that the term "evolution" refer to a single fact, I would argue that Darwin's phrase "descent with modification" is the appropriate characterization of the phenomenon of evolution. To assert that this phenomenon has taken place is to assert that life has developed over time with the presently existing species being the surviving descendants of earlier ones. Creationists have appropriately pointed out that Darwin's phrase implies much more than the relatively innocuous claim that life at present is different from what it was in the past. This claim is consistent with the view that all species were created at one point in time with some going extinct subsequently. Furthermore, Darwin's claim that present species are descendants of earlier ones can be contrasted to those of other evolutionary theorists such as Lamarck, who had quite different conceptions of the phenomenon of biological change. Lamarck believed in multiple and parallel "chains of being" all progressing to their goal in the human species. Given Darwin's disagreement with Lamarck about the phenomenon of evolution, it is not surprising that the two men proposed radically differing explanatory theories. Darwin's claim that life has experienced "descent with modification" thus is an assertion quite distinct from the relatively bland claim that the set of existing species has changed over time.

On the other hand, Richard Dawkins's characterization of modified descent generated exclusively by random mutation and natural selection as a "fact," what Phillip Johnson calls the "blind watchmaker's thesis," inappropriately blurs the distinction between phenomenon and theory. Dawkins fails to distinguish the phenomenon to be explained from the explanatory theory of adaptationism. Similarly, it is misleading to use the term "evolution" to refer to the observed consequences of natural selection acting on moth coloration or the dimensions of finch beaks. These cases are clear demonstrations of the phenomenon of natural selection that are more aptly called "microevolution."

One last point should put us in a position to improve significantly on Gould's distinction between evolution as fact and evolution as theory. There obviously is a far more varied set of phenomena considered to be appropriate for explanation by evolutionary biology than the simple claim that life has evolved through descent with modification. For example, why and how did horses gradually evolve hoofs to replace their earlier toe structure? The alleged single "phenomenon" of evolution thus might more accurately be stipulated as the phenomena of



evolution, or "evolutionary phenomena," but in full recognition of the relevant distinction between data and phenomena. Gould's analogy of Newton's theory of gravitation being to falling apples as modern evolutionary theory is to the descent of humans from apelike ancestors can thus be made more accurate. That is, modern evolutionary theory is to evolutionary phenomena as Newton's theory of gravitation is to gravitational phenomena.

An important pedagogical lesson to glean from all this is that a great deal of interesting scientific debate pertains to the establishment of the phenomena that need to be explained. Kepler's laws are complex phenomena that were accepted as "fact" by very few astronomers during the first half of the seventeenth century. They are extremely difficult to infer from the intricate data of planetary observations. Similarly, it is an exciting challenge to infer evolutionary phenomena from the relevant data. The difficult and controversial nature of the task is a direct consequence of the complexity of the data studied by paleontology and molecular biology. For example, it could be argued that individual fossils are phenomena in their own right. That is, aren't they complex results of inference based on the relatively simple data produced by radioactive dating techniques and anatomical measurements? Even if this suggestion is rejected, it should be clear that educators face a difficult challenge when confronted by the daunting ambiguity of the term "evolution." It would be a disservice to students to employ the word in a manner that suggests that it always refers straightforwardly to a single phenomenon unanimously recognized by the scientific community. While no one disagrees about the factual nature of Kepler's laws, some alleged evolutionary phenomena are generally agreed upon to be facts while others are not. It remains to be seen if the data/phenomenon distinction can help to rectify the present confusion in the contexts of education and law.

## Notes

- ⌘ 1. Ruse, Michael (1982): *Darwinism Defended, A Guide to the Evolution Controversies* (Reading: Addison-Wesley), p. 58.
- ⌘ 2. Klayman, Slocombe, Lehman and Kaufman (August 18, 1986): *Amicus Curiae Brief of 72 Nobel Laureates ...*, No. 85-1513, p. 6.
- ⌘ 3. Klayman, Slocombe, Lehman and Kaufman (August 18, 1986): *Amicus Curiae Brief of 72 Nobel Laureates ...*, No. 85-1513, p. 24.
- ⌘ 4. *Edwards v. Aguillard*, No. 85-1513.
- ⌘ 5. Ibid.
- ⌘ 6. Gould, Stephen Jay (1983): "Evolution as Fact and Theory," in *Hens's Teeth and Horse's Toes* (New York: Norton, p. 254.
- ⌘ 7. Johnson, Phillip (1993): *Darwin on Trial*, second edition (Downers Grove: InterVarsity), p. 67.
- ⌘ 8. Woodward, J. (1989): "Data and Phenomena," *Synthese*, vol. 79, pp. 393-472.  
Bogen, J. and Woodward, J. (1988): "Saving the Phenomena," *The Philosophical Review*, vol. 97, pp. 303-352.

⌘ 9. Davis, Percival and Kenyon, Dean (1993): *Of Pandas and People, The Central Question of Biological Origins*, second edition (Dallas: Haughton), pp. 154-157.

Copyright © 1996 James R. Hofmann. All rights reserved. International copyright secured.  
File Date: 11.14.96

## **Intelligent Design Defended from the Floor of the US House of Representatives**

### **INTELLIGENT DESIGN IS NOT A SCIENCE** (House of Representatives - June 14, 2000)

[Page: H4480] GPO's PDF

The SPEAKER pro tempore. Under a previous order of the House, the gentleman from Indiana (Mr. Souder) is recognized for 5 minutes.

**Mr. SOUDER.** Mr. Speaker, on June 1, I received a letter that was written by seven members of the biology department and one professor of psychology from Baylor University in response to my co-hosting a recent conference on intelligent design, the theory that an intelligent agency can be detected in nature, sponsored by the Discovery Institute.

The professors denounced intelligent design as pseudo science and advocated what is bluntly called the materialistic approach to science.

Mr. Speaker, I am appalled that any university seeking to discover truth, yet alone a university that is a Baptist Christian school, could make the kinds of statements that are contained in this letter. Is there position on teaching about materialistic science so weak that it cannot withstand scrutiny and debate?

Intelligent design theory is upheld by the same kind of data and analysis as any other theory to determine whether an event is caused by natural or intelligent causes; just as a detective relies on evidence to decide whether a death was natural or murder, and an insurance company relies on evidence to decide whether a fire is an accident or arson. A scientist looking at, say, the structure of a DNA molecule goes through exactly the same reasoning to decide whether the DNA code is the result of natural causes or an intelligent agent.

Today, qualified scientists are reaching the conclusion that design theory makes better sense of the data. Influential new books are coming out by scientists like molecular biologist Behe, *Darwin's Black Box*, the Free Press, and mathematician William Dembski, *The Design Inference*, Cambridge University Press, which point out the problems with Darwinian evolution and highlight evidence for intelligent design in the universe.

The tone of the letter I received seems to suggest that my congressional colleagues and I were unsuspecting honorary co-hosts in a conference on intelligent design. That is not the case. My good friend, the gentleman from Florida (Mr. Canady), chairman of the House Judiciary Subcommittee on the Constitution has considered holding a congressional hearing on the bias and viewpoint discrimination in science and science education. Ideological bias has no place in science and many of us in Congress do not want the government to be party to it.



The gentleman from Florida (Mr. Canady) approached several people, including the Discovery Institute, about plans for such a hearing. The people at Discovery suggested that instead we allow them merely to put on a modest informational briefing on intelligent design. That is exactly what happened, and we regarded the result as very valuable.

Nevertheless, many of us continue to be concerned about the unreasoning viewpoint discrimination in science. This letter dismisses those who do not share the philosophy of science favored by the authors as frauds. It is ironic, however, that the authors do not ever actually get around to answering the substantive arguments put forward by people at the Discovery Institute. The authors support a philosophy of science they call materialistic science. The key phrase in the letter is that we cannot consider God's role in the natural phenomenon we observe. Yet this assumption is merely asserted without any argument.

How can the authors of this letter be so confident that God plays no role in the observable world? Once we acknowledge that God exists, as these professors presumably do since they teach at a Christian university, there is no logical way to rule out the possibility that God may actually do something within the universe He created.

In addition, the philosophy of science the authors talk about is just that, a philosophy. It is not itself science, even according to the definition of science put forward by the authors themselves. They state, for example, that all observations must be explained through empirical observations. I am not sure what that means but I do know this: This statement itself is not verifiable by observation or by methods of scientific inquiry. It is rather a philosophical statement.

If they prefer it to the alternative that they suppose it advanced by the Discovery Institute folks, then the preference itself cannot be based on science. It is a difference of philosophy, but they are biologists not philosophers. They have no special authority in philosophy, even the philosophy of science.

Even more egregiously, they say that God cannot be proved or disproved. Now there is a philosophical statement for you. Of course many philosophers agree with it, but there are philosophers of stature who disagree with it, too. Why should the philosophical viewpoint of a group of biologists enjoy privileged status?

And then there was Darwinism. This letter treats Darwinism as a straightforwardly scientific position despite the criticism advanced by many responsible, informed people that Darwinism itself rests not on demonstrable facts but rather on controversial philosophical premises. In other words, serious people make a case against Darwinism, precisely the case that Baylor's biologists themselves are trying to make against intelligent design.

Yet the Baylor biologists simply ignore these criticisms. One senses here not a defense of science but rather an effort to protect, by political means, a privileged philosophical viewpoint against a serious challenge.

In digging into this matter further, it turns out that an international conference related to this topic, the Nature of Nature, was held recently at Baylor University. It was hosted by the Polanyi Center at Baylor and sponsored by the Discovery Institute and the John Templeton Foundation. A number of world-class scientists participated in the event, and contrary to the assertions made in this letter, advocates of intelligent design, as well as materialism, presented

their ideas publicly. The authors of this letter have been part of an intense effort to close down that center, which was founded in part to explore these issues.

I would like to insert the rest of this statement in the Record, as well as the letter from the professors at Baylor University.

I would like to reference the words of the Israeli statesman, Shimon Peres: He said, "Science and lies cannot coexist. You don't have a scientific lie, and you cannot lie scientifically. Science is basically the search of truth--known, unknown, discovered, undiscovered--and a system that does not permit the search for truth cannot be a scientific system. Then again, science must operate in freedom. You cannot have free research in a society that doesn't enjoy freedom. . . . So in a strange way, science carries with it a color of transparency, of openness, which is the beginning of democracy . . ."

Dr. Bruce Alberts, President of the National Academy of Sciences made a recent speech where he said "Scientists, as practitioners, teach important values. These include honesty, an eagerness for new ideas, the sharing of knowledge for public benefit, and a respect for evidence that requires verification by others. These 'behaviors of science' make science a catalyst for democracy. Science and democracy promote similar freedoms. Science and democracy accommodate, and are strengthened by, dissent. Science's requirement of proof resembles democracy's system of justice. Democracy is buttressed by science's values. And science is nurtured by democracy's principles."

There seems to be a tension between science as democratic, welcoming new ideas and dissent--and science as a lobby group, seeking to impose its viewpoint upon others. As the Congress, it might be wise for us to question whether the legitimate authority of science over scientific matters is being misused by persons who wish to identify science with a philosophy they prefer. Does the scientific community really welcome new ideas and dissent, or does it merely pay lip service to them while imposing a materialist orthodoxy?

Only a small percentage of Americans think the universe and life can be explained adequately in purely materialistic terms. Even fewer think real debate on the issue ought to be publicly suppressed.

I ask my colleagues to join with me in putting aside unfounded fears to explore the evidence and truthfulness of the theories that are being presented by those on both sides of this debate. I want to thank Philip Johnson of the University of California at Berkeley, Robert \* \* \* of Princeton University, and others in drafting this response.

Baylor University, June 1, 2000.

[Page: H4481] GPO's PDF

Dear Congressman Souder, We became aware of a meeting on May 10, 2000 that you and other legislators attended with members of the Discovery Institute from their website. According to the website, the main topics of the meeting involved the scientific case for design, the influence of the Darwinian and materialistic worldview on public policy, and how

intelligent design will affect education. As citizens concerned with science education, we wish to give you the perspective of mainstream scientists and science teachers.

[Page: H4482] GPO's PDF

## **INTELLIGENT DESIGN IS NOT SCIENCE**

It is an old philosophical argument that has been dressed up as science. We and other mainstream scientists refer to it as intelligent design creationism. Some have referred to it as "creeping creationism" due to the methods used by its proponents to sneak creation science into the classroom. The hypothesis of intelligent design is that living creatures are too complex to have arisen by random chance alone. However, we have yet to see any scientific, empirical data to support this hypothesis. Some of the proponents use statistics to show the improbability that living creatures have arisen by random chance, but this does not say that living things could not have arisen through such means. The members of the Discovery Institute stress that the idea of design is entirely empirical. If this is true, then their data should be presented to the scientific community. If mainstream scientists deem the data as evidence for design, then your office will be flooded with messages from professional scientists asking for more funding for design research. However, as the supporters of intelligent design have never openly presented their data, we have to conclude that either there is none or that it does not provide evidence for design.

## **THE PROPONENTS OF INTELLIGENT DESIGN DO NOT OPERATE AS LEGITIMATE SCIENTISTS**

In science, all research must go through some sort of peer review. A scientist requests funds from various agencies, such as the National Science Foundation (NSF), which requires the scientists to give a detailed explanation of the research to be conducted. After conducting the research, the scientist then publishes or presents his/her findings in peer reviewed, scientific journals or at meetings sponsored by scientific organizations. In this way, other scientists can critically study the research, how it was conducted, and if its conclusions are correct. Proponents of intelligent design do none of this. Their funding comes from think tanks such as the Discovery Institute which have their own agenda. They do not publish in scientific journals nor present their ideas at meetings sponsored by scientific organizations. Rather, they publish books for the general public which go through no sort of review process except by editors at publishing companies who are often concerned more with the financial gains and less of the scientific merit of the book.

## **INTELLIGENT DESIGN DOES NOT BELONG IN THE SCIENCE CLASSROOM**

Because intelligent design has no scientific, empirical data to support it, we see no reason why it should be allowed into the science classroom. The proponents of intelligent design would say that they should have equal time in the classroom as a competing theory against Darwinism. However, in science, a theory isn't given equal time, it earns equal time. Ideas should be allowed into the science classroom only when they have amassed so much empirical evidence as to gain the support of the scientific community. Intelligent design has not risen to this level.

## **INTELLIGENT DESIGN COULD HAVE A SERIOUS NEGATIVE IMPACT ON SCIENCE EDUCATION AND RESEARCH**

Much of the proposed research from intelligent design deals mainly with understanding the personality and limits of the designer. Within the intelligent design paradigm, a possible answer to any scientific question is "That's how the designer wanted it". This does not answer

anything at all. How are science teachers to inspire curiosity into the natural world when the answer to every question is "That's just how it is", Also, we fear that future school board administrators would cut funds for science education because the role of science will have shifted from an exploration of the natural world to an exploration into the mind of a supposed designer. This could also have a negative impact on scientific research. Future Congresses with the need to balance budgets may cut funding to the National Science Foundation, Center for Disease Control, or National Institute for Health for the same reason as the school board administrator.

### **THE MEMBERS OF THE DISCOVERY CENTER ARE MISREPRESENTING MATERIALISTIC SCIENCE**

The current philosophy of science states that all observations must be explained through empirical observations. Materialistic science does not say that there is no God. Rather, it says that God, due to His supernatural and divine nature, cannot be proved or disproved, thus we cannot consider His role in the natural phenomena we observe. Therefore, the existence of God is not a question within the realm of science. Many scientists have a strong belief in a divine God and do not see any conflict between this belief and their work as scientists.

### **MATERIALISTIC SCIENCE HAS GREATLY INCREASED THE AMERICAN PEOPLE'S QUALITY OF LIFE**

Considering that materialistic science has been the predominant paradigm of science for about 150 years, let us look at life in America before and after the 1850's. First, all races were certainly not considered as equals. Women were considered inferior to men in every way. Also, the number of cause of death in women was giving birth. The infant mortality rate was equal to any Third World nation today. People died of diseases such as polio, small pox, and influenza. Mentally ill people were locked up in institutions that resembled the horrors of the Inquisitions. The average life expectancy for people born in the 1850's was in the early sixties. Since the advent of materialistic science we have shown that all the races are much more alike than they are different. Medical health for women has improved to the point that couples rarely worry if the woman and/or child will die during birth. Also, women have become more empowered than any other time in human history. Diseases such as polio and small pox have essentially been wiped out in America. Also, due to improved sanitation and health regulations, typhoid, cholera, and malaria, are unheard of in America today. Mental illness is seen as a treatable, if not curable, disease. Children born in the 1990's could expect to live to be ninety years old.

### **THE PROPONENTS OF INTELLIGENT DESIGN ARE MAKING AN EMOTIONAL APPEAL AND NOT A SCIENTIFIC ARGUMENT**

The proponents of intelligent design are trying to use meetings such as the one that you attended to make an emotional plea to the general public about the ills that face our society. They would have us believe that all of our problems in society can be blamed on Darwinism. As a U.S. Legislator, we are certain you are aware of the many problems, great and small, facing America. As any concerned citizen, we watch the news and wonder why is there violence in the schools, why does racism and intolerance persist, and why can't the greatest nation in the world feed and house all of its people? The answer to these questions is neither Darwinian evolution nor materialistic science. Rather materialistic science could be the cure for many of society's problems.

We thank you in advance for considering the above information and for seeking more complete information regarding this important issue affecting the congressional debate regarding science education programs in this country.

Sincerely,

Cliff Hamrick, Biology Department, Baylor University.  
Robert Baldrige, Professor of Biology, Baylor University.  
Richard Duhrkopf, Associate Professor of Biology, Baylor University.  
Lewis Barker, Professor of Psychology & Neuroscience, Baylor University.  
Wendy Sera, Assistant Professor of Biology, Baylor University.  
Darrell Vodopich, Associate Professor of Biology, Baylor University.  
Sharon Conry, Biology Department, Baylor University.  
Cathleen Early, Biology Department, Baylor University.

[TIME: 2310]

The SPEAKER pro tempore (Mr. Pease). Under a previous order of the House, the gentleman from New Jersey (Mr. Holt) is recognized for 5 minutes.

(Mr. HOLT addressed the House. His remarks will appear hereafter in the Extensions of Remarks.)

Copyright 2000 Access Research Network. All rights reserved. International copyright secured.

File Date: 7.01.00

replica breitling breitling replica watches

### **The Methodological Equivalence of Design & Descent: Can There Be a Scientific "Theory of Creation"?**

**Stephen C. Meyer**

Reprinted from *The Creation Hypothesis*, ed. by J.P. Moreland (InterVarsity Press, 1994)

During the last thirty years the idea of design has undergone a renaissance in some scientific and philosophical circles. Developments in physics and cosmology, in particular, have placed the word *design* back in the scientific vocabulary as physicists have unveiled a universe apparently fine-tuned for the possibility of human life (see discussion in chapter four). The speed of light, the strength of gravitational attraction, the properties of the water molecule and many other features of the cosmic architecture appear to have been fortuitously arranged and balanced for human benefit.

While many have postulated so-called anthropic principles or "many worlds scenarios" to explain (or explain away) this apparent design without recourse to God, some have eschewed

these secular notions and posited the activity of a preexistent intelligence a Creator as the simplest explanation for the "coincidences" upon which life seems to depend. As Sir Fred Hoyle has suggested, a common sense interpretation suggests that "a superintellect has monkeyed with physics" in order to make life possible. Similarly, astronomer George Greenstein wrote in a recent book provocatively subtitled *Life and Mind in the Cosmos*: "The thought insistently arises that some supernatural agency or rather Agency must be involved. Is it possible that suddenly, without intending to, we have stumbled upon scientific proof of the existence of a Supreme Being? Was it God who stepped in and so providentially crafted the cosmos for our benefit?"

Despite this renewal of interest in the (intelligent) design hypothesis among physicists and cosmologists, biologists have remained reluctant to consider such notions. As historian of science Timothy Lenior has observed, "Teleological thinking has been steadfastly resisted by modern biology. And yet, in nearly every area of research biologists are hard pressed to find language that does not impute purposiveness to living forms."

The tendency Lenior has observed among biologists seems both puzzling and ironic. At first glance, the complexity of living systems far exceeds any encountered in the physical sciences. Information-storage and transfer systems, regulatory and feedback mechanisms, structures for manufacturing and repairing precisely coded and sequenced strings of chemical "symbols" all on a miniaturized scale characterize even the simplest cells. Ernst Haeckel's nineteenth-century vision of simple "homogeneous globules of plasm" has yielded to the modern molecular image of a complex cellular factory.

Moreover, the growing awareness of biological complexity has created something of an impasse in contemporary origins theory (see the chapter by Bradley and Thaxton in this volume). Various contradictory conjectures have appeared as scientists have attempted to explain how purely natural processes could have given rise to the unlikely and yet functionally specified systems found in biology systems that comprise, among other things, massive amounts of coded genetic information. The origin of such information, whether in the first protocell or at those discrete points in the fossil record that attest to the emergence of structural novelty, remains essentially mysterious on any current naturalistic evolutionary account.

Not surprisingly, critical scientific analyses of both chemical and neo-Darwinian evolutionary theory have proliferated in recent years. Some observers have gone so far as to characterize origin-of-life studies and neo-Darwinism as paradigms in crisis or degenerate research programs. As biophysicist Dean Kenyon, a once-prominent origin-of-life researcher, said concerning his own discipline several years ago: "The more . . . we have learned in recent two or three decades about the chemical details of life, from molecular biology and origin-of-life studies . . . the less likely does a strictly naturalistic explanation of origins become."

Similarly, Francis Crick has written, "An honest man, armed with all the knowledge available to us now, could only state that in some sense, the origin of life appears at the moment to be almost a miracle, so many are the conditions which would have been satisfied to get it going."

While Kenyon has since embraced the design hypothesis (thus explaining his fall from prominence), Crick and most others in the biological community have remained firmly committed to the view that naturalistic processes will eventually suffice to explain the origin of new biological information and structure. Thus, despite the current impasse and a growing

body of at least highly suggestive evidence for intelligent design, discussion of the design hypothesis has remained almost entirely out of bounds in biology. Why?

At least part of the reason for this reticence may not be hard to discern. Biologists, and scientists generally, assume the rules of science prohibit any deviation from a strictly materialistic mode of analysis. Even most physicists sympathetic to design would quickly label their intuitions "religious" or "philosophical" rather than "scientific." Science, it is assumed, must look for exclusively natural causes. Since the postulation of an intelligent Designer or Creator clearly violates this methodological norm, such a postulation cannot qualify as a part of a scientific theory. Thus Stephen J. Gould refers to "scientific creationism" not just as factually mistaken but as "self-contradictory nonsense." As Basil Willey put it, "Science must be provisionally atheistic, or cease to be itself."

Most scientists who are theists also accept this same conception of science. As Raymond Grizzle wrote in a prominent evangelical scientific journal recently, "God cannot be part of a scientific description. . . . [Further], any description that *implies* a creator will probably also be looked at as improper by most scientists." Nancey Murphy, a philosopher and Fuller Seminary professor, agrees. She wrote recently in the same journal: "Science qua science seeks naturalistic explanations for all natural processes. Christians and atheists alike must pursue scientific questions in our era without invoking a Creator. . . . Anyone who attributes the characteristics of living things to creative intelligence has by definition stepped into the arena of either metaphysics or theology."

Yet on what basis is this definition of science asserted? For Murphy and Grizzle the answer seems clear. A respect for the rules and practices of science as they have come down to us dictates that Christians should avoid invoking creative intelligence in their theories. In Murphy's words, "*For better or worse*, we have *inherited* a view of science as methodologically atheistic" (emphasis added). Grizzle, too, appeals to convention to justify methodological naturalism:

All modern science, not just biological evolutionary theory, by definition excludes God. . . . There is no rule book that spells this out, and indeed it has been argued that it is an arbitrary restriction. Furthermore, this has become the case only in the last 100 years or so. Nonetheless, this is one of the restrictions almost universally put upon science by those who practice it, and it seems to me quite desirable and likely that science will retain this restriction in the foreseeable future.

Of course, it does not follow that just because science is or has been wholly naturalistic, it should remain so. The indicative does not, after all, imply the imperative. Therefore, Murphy and Grizzle's appeal to convention and current practice invites scrutiny of the grounds on which the scientific community has asserted naturalism as normative to its practice. Indeed, if the customary definition of science is exposed as *just* an arbitrary convention, some practicing scientists may wish to repudiate it, especially if they now judge empirical evidence sufficient to motivate a consideration of some nonnaturalistic theory of origins. In any case, beyond a fallacious appeal to power, it would be difficult to see why those disinclined to accept methodological naturalism should not be free to operate under a less restrictive definition of science.

However Christian intellectuals might go about defending methodological naturalism, secular defenders of the principle assure us that the prohibition against invoking God or creative

intelligence is anything but arbitrary. Instead, they assert that good independent reasons exist for the conventional exclusion of such notions from all scientific theories. Theories of design or creation do not, they say, meet objective standards of scientific method and practice. Such theories do not explain by reference to natural law, nor do they manifest a host of other features of true scientific theories such as testability, observability and falsifiability. Thus, unlike naturalistic evolutionary theories, creationist or design theories are methodologically deficient. Creationist theories may or may not be true, but they can never, that is, in principle be considered scientific.

The use of what philosophers of science call "demarcation arguments" arguments that purport to distinguish science from pseudoscience, metaphysics or religion in defense of a favored theory has a long history. Darwin himself employed such arguments to defend his theory from idealist and creationist challenges. While philosophical arguments about what does or does not constitute science have generally been discredited within philosophy of science, they nevertheless continue to play a vital role in persuading biologists that alternative scientific explanations do not, and in the case of nonnaturalistic theories *cannot*, exist for biological origins. Indeed, various demarcation criteria are often cited by scientists as reasons for rejecting the very possibility of intelligent design.

The purpose of this chapter is to examine the case against the possibility of a scientific theory of intelligent design or creation. Several of the criteria said to distinguish the scientific status of naturalistic evolutionary theories (hereafter "descent") from admittedly nonnaturalistic theories of creation or design (hereafter "design") will be examined. It will be argued that a priori attempts to make distinctions of scientific status on methodological grounds inevitably fail and, instead, that a general equivalence of method exists between these two competing approaches to origins. In short, I will argue that intelligent design and naturalistic descent are methodologically equivalent--that is, that design and descent prove equally scientific or equally unscientific depending upon the criteria used to adjudicate their scientific status and provided metaphysically neutral criteria are selected to make such assessments. In the process of making this argument, I will also discuss whether a scientific theory of creation or design could be formulated or whether methodological objections, forever and in principle, make the assertion of a scientific theory of creation an "oxymoron" or "self-contradictory nonsense," as Ruse, Stent, Gould and others have claimed.

Throughout this paper, the alliterative terms *design* and *descent* will be used as a convenient shorthand to distinguish two types of theories: (1) those that invoke the causal action of an *intelligent* agent (whether divine or otherwise) as part of the explanation for the origin of biological form or complexity and (2) those (such as Darwin's "descent with modification") that rely solely on *naturalistic* processes to explain the origin of form or complexity.

By way of qualification, it should be noted that by defending the methodological and scientific legitimacy of design, this chapter is not seeking to rehabilitate the empirically inadequate biology of many nineteenth-century creationists or their belief in the absolute fixity of species; nor is it attempting to endorse modern young-earth geology. The following analysis concerns the methodological legitimacy of design in principle as defined above, not the empirical adequacy of specific theories that might invoke intelligent design in the process of making other empirical claims.

The methodological equivalence of intelligent design and naturalistic descent will be suggested in three stages by three lines of argument. First, the reasons for the failure of



demarcation arguments within philosophy of science generally will be examined and recapitulated. This analysis will suggest that attempts to distinguish the scientific status of design and descent a priori may well be suspect from the outset on philosophical grounds. Second, an examination of specific demarcation arguments that have been employed against design will follow. It will be argued that not only do these arguments fail, but they do so in such a way as to suggest an equivalence between design and descent with respect to several features of allegedly proper scientific practice that is, intelligent design and naturalistic descent will be shown equally capable or incapable of meeting different demarcation standards, provided such standards are applied disinterestedly. Third, design and descent will be compared in light of recent work on the logical and methodological character of historical inquiry. This analysis will show that the mode of inquiry utilized by advocates of both design and descent conforms closely to that evident in many other characteristically historical disciplines. Thus a more fundamental methodological equivalence between design and descent will emerge as a result of methodological analysis of the historical sciences.

### **Part 1: The General Failure of Demarcation Arguments**

To show that design "can never be considered a scientific pursuit," biologists and others have asserted that design does not meet certain objective criteria of scientific method or practice. In short, biologists have employed so-called demarcation arguments to separate a scientific approach to origins (descent) from an allegedly nonscientific approach (design). While an examination of the particular criteria employed in such arguments will not concern us in the first part of this chapter, the general practice of demarcation will.

From the standpoint of the philosophy of science, the use of demarcation arguments is generally problematic. Historically, attempts to find methodological "invariants" that provide a set of necessary and sufficient conditions for distinguishing true science from pseudoscience have failed. Moreover, most current demarcation arguments presuppose an understanding of how science operates that reflects the influence of a philosophy of science known as logical positivism. Yet since the 1950s philosophers of science have decisively rejected positivism for a number of very good reasons (see below). As a result, the enterprise of demarcation has generally fallen into disrepute among philosophers of science.

In his essay "The Demise of the Demarcation Problem," philosopher of science Larry Laudan gives a brief but thorough sketch of the different grounds that have been advanced during the history of science for distinguishing science from nonscience. He notes that the first such grounds concerned the degree of certainty associated with scientific knowledge. Science, it was thought, could be distinguished from nonscience because science produced certainty whereas other types of inquiry such as philosophy produced opinion. Yet this approach to demarcation ran into difficulties as scientists and philosophers gradually realized the fallible nature of scientific disciplines and theories. Unlike mathematicians, scientists rarely provide strict logical demonstrations (deductive proofs) to justify their theories. Instead, scientific arguments often utilize inductive inference and predictive testing, neither of which produces certainty. As Owen Gingerich has argued, much of the reason for Galileo's conflict with the Vatican stemmed from Galileo's inability to meet scholastic standards of deductive certainty a standard that he regarded as neither relevant to nor attainable by scientific reasoning. Similar episodes subsequently made it clear that science does not necessarily possess a superior epistemic status; scientific knowledge, like other knowledge, is subject to uncertainty.

By the nineteenth century, attempts to distinguish science from nonscience had changed. No longer did demarcationists attempt to characterize science on the basis of the superior epistemic status of scientific theories; rather, they attempted to do so on the basis of the superior methods science employed to produce theories. Thus science came to be defined by reference to its method, not its content. Demarcation criteria became methodological rather than epistemological.

Nevertheless, this approach also encountered difficulties, not the least of which was a widespread disagreement about what the method of science really is. If scientists and philosophers cannot agree about what *the* scientific method is, how can they disqualify disciplines that fail to use it? Moreover, as the discussion of the historical sciences in part three of this chapter will make clear, there may well be more than one scientific method. If that is so, then attempts to mark off science from nonscience using a single set of methodological criteria will most likely fail. The existence of a variety of scientific methods raises the possibility that no single methodological characterization of science may suffice to capture the diversity of scientific practice. Using a single set of methodological criteria to assess scientific status could therefore result in the disqualification of some disciplines already considered to be scientific.

As problems with using methodological considerations grew, demarcationists shifted their focus again. Beginning in the 1920s, philosophy of science took a linguistic or semantic turn. The logical positivist tradition held that scientific theories could be distinguished from nonscientific theories not because scientific theories had been produced via unique or superior methods, but because such theories were more meaningful. Logical positivists asserted that all meaningful statements are either empirically verifiable or logically undeniable. According to this "verificationist criterion of meaning," scientific theories are more meaningful than philosophical or religious ideas, for example, because scientific theories refer to observable entities such as planets, minerals and birds, whereas philosophy and religion refer to such unobservable entities as God, truth and morality.

Yet as is now well known, positivism soon self-destructed. Philosophers came to realize that positivism's verificationist criterion of meaning did not achieve its own standard. That is, the assumptions of positivism turn out to be neither empirically verifiable nor logically undeniable. Furthermore, positivism's verificationist ideal misrepresented much actual scientific practice. Many scientific theories refer to unverifiable and unobservable entities such as forces, fields, molecules, quarks and universal laws. Meanwhile, many disreputable theories (e.g., the flat-earth theory) appeal explicitly to "common-sense" observations. Clearly, positivism's verifiability criterion would not achieve the demarcation desired.

With the death of positivism in the 1950s, demarcationists took a different tack. Other semantic criteria emerged, such as Sir Karl Popper's falsifiability. According to Popper, scientific theories were more meaningful than nonscientific ideas because they referred only to empirically falsifiable entities. Yet this, too, proved to be a problematic criterion. First, falsification turns out to be difficult to achieve. Rarely are the core commitments of theories directly tested via prediction. Instead, predictions occur when core theoretical commitments are conjoined with auxiliary hypotheses, thus always leaving open the possibility that auxiliary hypotheses, not core commitments, are responsible for failed predictions.

Newtonian mechanics, for example, assumed as its core three laws of motion and the theory of universal gravitation. On the basis of these, Newton made a number of predictions about

the positions of planets in the solar system. When observations failed to corroborate some of his predictions, he did not reject his core assumptions. Instead, he scrutinized some of his auxiliary hypotheses to explain the discrepancies between theory and observation. For example, he examined his working assumption that planets were perfectly spherical and influenced only by gravitational force. As Imre Lakatos has shown, Newton's refusal to repudiate his core in the face of anomalies enabled him to refine his theory and eventually led to its tremendous success. Newton's refusal to accept putatively falsifying results certainly did not call into question the scientific status of his gravitational theory or his three laws.

The function of auxiliary hypotheses in scientific testing suggests that many scientific theories, including those in so-called hard sciences, may be very difficult, if not impossible, to falsify conclusively. Yet many theories that have been falsified in practice via the consensus judgment of the scientific community must qualify as scientific according to the falsifiability criterion. Since they have been falsified, they are obviously falsifiable, and since they are falsifiable, they would seem to be scientific.

And so it has gone generally with demarcation criteria. Many theories that have been repudiated on evidential grounds express the very epistemic and methodological virtues (testability, falsifiability, observability, etc.) that have been alleged to characterize true science. Many theories that are held in high esteem lack some of the allegedly necessary and sufficient features of proper science. As a result, with few exceptions most contemporary philosophers of science regard the question "What methods distinguish science from nonscience?" as both intractable and uninteresting. What, after all, is in a name? Certainly not automatic epistemic warrant or authority. Thus philosophers of science have increasingly realized that the real issue is not whether a theory is scientific but whether it is true or warranted by the evidence. Thus, as Martin Eger has summarized, "demarcation arguments have collapsed. Philosophers of science don't hold them anymore. They may still enjoy acceptance in the popular world, but that's a different world."

The "demise of the demarcation problem," as Laudan calls it, implies that the use of positivistic demarcationist arguments by evolutionists is, at least *prima facie*, on very slippery ground. Laudan's analysis suggests that such arguments are not likely to succeed in distinguishing the scientific status of descent *vis-a-vis* design or anything else for that matter. As Laudan puts it, "If we could stand up on the side of reason, we ought to drop terms like 'pseudo-science.' . . . They do only emotive work for us."

If philosophers of science such as Laudan are correct, a stalemate exists in our analysis of design and descent. Neither can automatically qualify as science; neither can be necessarily disqualified either. The *a priori* methodological merit of design and descent are indistinguishable if no agreed criteria exist by which to judge their merits.

Yet lacking any definite metric, one cannot yet say that design and descent are methodologically equivalent in any nontrivial sense. In order to make this claim we must compare design and descent against some specific standards. Let's now consider the specific demarcation arguments that have been erected against design. For though demarcation arguments have been discredited by philosophers of science generally, they still enjoy wide currency in the scientific and "popular world," as the following section will make abundantly clear.

## Part 2: Specific Demarcation Arguments Against Design

Despite the consensus among philosophers of science that the demarcation problem is both intractable and ill-conceived, many scientists continue to invoke demarcation criteria to discredit quacks, cranks and those otherwise perceived as intellectual opponents. Yet to the average working scientist Laudan's arguments against demarcation may seem counter intuitive at best. On the surface it may appear that there ought to be some unambiguous criteria for distinguishing such dubious pursuits as parapsychology, astrology and phrenology from established sciences such as physics, chemistry and astronomy. That most philosophers of science say that there are not such criteria only confirms the suspicions many scientists have about philosophers of science. After all, don't some philosophers of science say that scientific truth is determined by social and cultural context? Don't some even deny that science describes an objective reality?

Well, as it turns out, one does not need to adopt a relativistic or antirealist view of science to accept what Laudan and others say about the demarcation problem. Indeed, the two positions are logically unrelated. Laudan is not arguing that all scientific theories have equal warrant (quite the reverse) or that scientific theories never refer to real entities. Instead, he simply says that one cannot define science in such a way as to confer automatic epistemic authority on favored theories simply because they happen to manifest features alleged to characterize all "true science." When evaluating the warrant or truth claims of theories, we cannot substitute abstractions about the nature of science for empirical evaluation.

Nevertheless, establishing Laudan's general thesis is not the main purpose of this chapter. This chapter is not seeking to establish the impossibility of demarcation in general, but the methodological equivalence of intelligent design and naturalistic descent. Since some may yet doubt that demarcation *always* fails, the following section will examine some of the specific demarcation arguments that have been deployed against design by proponents of descent. It will suggest that these arguments fail to provide any grounds for distinguishing the methodological merit of one over the other and, instead, that careful analysis of these arguments actually exposes reasons for regarding design and descent as methodologically equivalent. Indeed, the following analysis will suggest that metaphysically neutral criteria do not exist that can define science narrowly enough to disqualify theories of design *tout court* without also disqualifying theories of descent on identical grounds.

Unfortunately, to establish this conclusively would require an examination of all the demarcation arguments that have been used against design. And indeed, an examination of evolutionary polemic reveals many such arguments. Design or creationist theories have been alleged to be necessarily unscientific because they (a) do not explain by reference to natural law, (b) invoke unobservables, (c) are not testable, (d) do not make predictions, (e) are not falsifiable, (f) provide no mechanisms, (g) are not tentative, and (h) have no problem-solving capability.

Due to space constraints, a detailed analysis of only the first three arguments will be possible. Nevertheless, an extensive analysis of (a), (b) and (c) will follow. These three have been chosen because each can be found in one form or another all the way back to the *Origin of Species*. The first one, (a), is especially important because the others derive from it a point emphasized by Michael Ruse, perhaps the world's most ardent evolutionary demarcationist. Consequently an analysis of assertion (a) will occupy the largest portion of this section. There will also be a short discussion of arguments (d), (e) and (f) and references to literature refuting

(g) and (h). Thus while an exhaustive analysis of all demarcationist arguments will not be possible here, enough will be said to allow us to conclude that the principal arguments employed against design do not succeed in impugning its scientific status without either begging the question or undermining the status of descent as well.

*Explanation via natural law.* Now let us examine the first, and according to Michael Ruse most fundamental, of the arguments against the possibility of a scientific theory of design. This argument states: "Scientific theories must explain by natural law. Because design or creationist theories do not do so, they are necessarily unscientific."

This argument invokes one of the principal criteria of science adopted by Judge William Overton after hearing the testimony of philosopher of science Michael Ruse in the Arkansas creation-science trial of 1981-82. As recently as March 1992, Ruse has continued to assert "must explain via natural law" as a demarcation criterion, despite criticism from other philosophers of science such as Philip Quinn and Larry Laudan. Ruse has argued that to adopt the scientific outlook, one must accept that the universe is subject to natural law, and further, that one must never appeal to an intervening agency as an explanation for events. Instead, one must always look to what he calls "unbroken law" if one wishes to explain things in a scientific manner.

There are several problems with this assertion and the conception of science that Ruse assumes. In particular, Ruse seems to assume a view of science that equates scientific laws with explanations. There are two problems with this view and correspondingly two main reasons that "explains via natural law" will not do as a demarcation criterion.

First, many laws are descriptive and not explanatory. Many laws describe regularities but do not explain why the regular events they describe occur. A good example of this drawn from the history of science is the universal law of gravitation, which Newton himself freely admitted did not explain but instead merely described gravitational motion. As he put it in the "General Scholium" of the second edition of the *Principia*, "I do not feign hypotheses" in other words, "I offer no explanations." Insisting that science must explain by reference to "natural law" would eliminate from the domain of the properly scientific all fundamental laws of physics that describe mathematically, but do not explain, the phenomena they "cover."

For the demarcationist this is a highly paradoxical and undesirable result, since much of the motivation for the demarcationist program derives from a desire to ensure that disciplines claiming to be scientific match the methodological rigor of the physical sciences. While this result might alleviate the "physics envy" of many a sociologist, it does nothing for demarcationists except defeat the very purpose of their enterprise.

There is a second reason that laws cannot be equated with explanations or causes. This, in turn, gives rise to another reason that science cannot be identified only with those disciplines that explain via natural law. Laws cannot be equated with explanations, not just because many laws do not explain but also because many explanations of particular events, especially in applied or historical science, may not utilize laws. While scientists may often use laws to assess or enhance the plausibility of explanations of particular events, analysis of the logical requirements of explanation has made clear that the citation of laws is not necessary to many such explanations. Instead, many explanations of particular events or facts, especially in the historical sciences, depend primarily, even exclusively, upon the specification of past causal conditions and events rather than laws to do what might be called the "explanatory work."

That is, citing past causal events often explains a particular event better than, and sometimes without reference to, a law or regularity in nature.

One reason laws play little or no role in many historical explanations is that many particular events come into existence via a series of events that will not regularly reoccur. In such cases laws are not relevant to explaining the contrast between the event that has occurred and what could have or might have ordinarily been expected to occur. For example, a historical geologist seeking to explain the unusual height of the Himalayas will cite particular antecedent factors that were present in the case of the Himalayan orogeny but were absent in other mountain-building episodes. Knowing the laws of geophysics relevant to mountain-building generally will aid the geologist very little in accounting for the contrast between the Himalayan and other orogenies, since such laws would presumably apply to all mountain-building episodes. What the geologist needs in the search for an explanation in this case is not knowledge of a general law but evidence of a unique or distinctive set of past conditions. Thus geologists have typically explained the unique height of the Himalayas by reference to the past position of the Indian and Asian land masses (and plates) and the subsequent collision that occurred between them.

The geologist's situation is very similar to that faced by historians generally. Consider the following factors that might help explain why World War I began: the ambition of Kaiser Wilhelm's generals, the Franco-Russian defense pact and the assassination of Archduke Ferdinand. Note that such possible explanatory factors invariably involve the citation of past events, conditions or actions rather than laws. Invoking past events as causes in order to explain subsequent events or present evidences is common both in history and in natural scientific disciplines such as historical geology. As Michael Scriven has shown, one can often know what caused something even when one cannot relate causes and effects to each other in formal statements of law. Similarly, William Alston has shown that laws alone often do not explain particular events even when we have them. The law "Oxygen is necessary to combustion" does not explain why a particular building burned down at a particular place and time. To explain such a particular fact requires knowing something about the situation just before the fire occurred. It does little good to know scientific laws; what one requires is information concerning, for example, the presence of an arsonist or the lack of security at the building or the absence of a sprinkler system. Thus Alston concludes that to equate a law with an explanation or cause "is to commit a 'category mistake' of the most flagrant sort."

Perhaps another example will help. If one wishes to explain why astronauts were able to fly to the moon when apples usually fall to the earth, one will not primarily cite the law of gravity. Such a law is far too general to be primarily relevant to explanation in this context, because the law allows for a vast array of possible outcomes depending on initial and boundary conditions. The law stating that all matter gravitates according to an inverse square law is consistent with both an apple falling to the earth and with an astronaut flying to the moon. Explaining why the astronaut flew when apples routinely fall, therefore, requires more than citing the law, since the law is presumed operative in both situations. Accounting for the differing outcomes the falling apple and the flying astronaut will require references to the antecedent conditions and events that differed in the two situations. Indeed, explanation in this case involves an accounting of the way engineers have used technology to alter the *conditions* affecting the astronauts to allow them to overcome the constraints that gravity ordinarily imposes on earthbound objects.

Such examples suggest that many explanations of particular events--explanations that occur frequently in fields already regarded as scientific such as cosmology, archaeology, historical geology, applied physics and chemistry, origin-of-life studies and evolutionary biology would lose their scientific status if Ruse's criterion of "explains via natural law" were accepted as normative to all scientific practice.

Consider an example from evolutionary biology that impinges directly on our discussion. Stephen Jay Gould, Mark Ridley and Michael Ruse argue that the "fact of evolution" is secure even if an adequate theory has not yet been formulated to describe or explain how large-scale biological change generally occurs. Like Darwin, modern evolutionary theorists insist that the question whether evolution did occur can be separated logically from the question of the means by which nature generally achieves biological transformations. Evolution in one sense historical continuity or common descent is asserted to be a well-established scientific theory because it alone explains a diverse class of present data (fossil progression, homology, biogeographical distribution, etc.), even if biologists cannot yet explain how evolution in another sense a general process or mechanism of change occurs. Some have likened the logical independence of common descent and natural selection to the logical independence of continental drift and plate tectonics. In both the geological situation and the biological there exist theories about *what happened* that explain why we observe many present facts, and separate theories that explain *how things could have* happened as they apparently did. Yet the former purely historical explanations do not require the latter nomological or mechanistic explanations to legitimate themselves. Common descent explains some facts well, even if nothing yet explains how the transformations it requires could have occurred.

This example again illustrates why historical explanations do not require laws. More important, it also demonstrates why Ruse's demarcation criterion proves fatal to the very Darwinism he is seeking to protect. Common descent, arguably the central thesis of the *Origin of Species*, does not explain by natural law. Common descent explains by postulating a hypothetical pattern of historical events which, if actual, would account for a variety of presently observed data. Darwin himself refers to common descent as the *vera causa* (that is, the actual cause or explanation) for a diverse set of biological observations. In Darwin's historical argument for descent, as with historical explanations generally, postulated past causal events (or patterns thereof) do the primary explanatory work. Laws do not.

At this point the evolutionary demarcationist might grant the explanatory function of antecedent events but deny that scientific explanations can invoke *supernatural* events. To postulate naturally occurring past events is one thing, but to postulate supernatural events is another. The first leaves the laws of nature intact; the second does not and thus lies beyond the bounds of science. As Ruse and Richard Lewontin have argued, miraculous events are unscientific because they violate or contradict the laws of nature, thus making science impossible.

Many contemporary philosophers disagree with Ruse and Lewontin about this, as have a number of good scientists over the years Isaac Newton and Robert Boyle, for example. The action of agency (whether divine or human) need not violate the laws of nature; in most cases it merely changes the initial and boundary conditions on which the laws of nature operate. But this issue must be set aside for the moment. For now it will suffice merely to note that the criterion of demarcation has subtly shifted. No longer does the demarcationist repudiate design as unscientific because it does not "explain via natural law"; now the demarcationist

rejects intelligent design because it does not "explain naturalistically." To be scientific a theory must be naturalistic.

But why is this the case? Surely the point at issue is whether there are independent and metaphysically neutral grounds for disqualifying theories that invoke nonnaturalistic events--such as instances of agency or intelligent design. To assert that such theories are not scientific because they are not naturalistic simply assumes the point at issue. Of course intelligent design is not wholly naturalistic, but why does that make it unscientific? What noncircular reason can be given for this assertion? What independent criterion of method demonstrates the inferior scientific status of a nonnaturalistic explanation? We have seen that "must explain via law" does not. What does?

*Unobservables and testability.* At this point evolutionary demarcationists must offer other demarcation criteria. One that appears frequently both in conversation and in print finds expression as follows: "Miracles are unscientific because they can not be studied empirically. Design invokes miraculous events; therefore design is unscientific. Moreover, since miraculous events can't be studied empirically, they can't be tested. Since scientific theories must be testable, design is, again, not scientific." Molecular biologist Fred Grinnell has argued, for example, that intelligent design can't be a scientific concept because if something "can't be measured, or counted, or photographed, it can't be science." Gerald Skoog amplifies this concern: "The claim that life is the result of a design created by an intelligent cause can not be tested and is not within the realm of science." This reasoning was recently invoked at San Francisco State University as a justification for removing Professor Dean Kenyon from his classroom. Kenyon is a biophysicist who has embraced intelligent design after years of work on chemical evolution. Some of his critics at SFSU argued that his theory fails to qualify as scientific because it refers to an unseen Designer that cannot be tested.

The essence of these arguments seems to be that the unobservable character of a designing agent renders it inaccessible to empirical investigation and thus precludes the possibility of testing any theory of design. Thus the criterion of demarcation employed here conjoins "observability and testability." Both are asserted as necessary to scientific status, and the converse of one (unobservability) is asserted to preclude the possibility of the other (testability).

It turns out, however, that both parts of this formula fail. First, observability and testability are not both necessary to scientific status, because observability at least is not necessary to scientific status, as theoretical physics has abundantly demonstrated. Many entities and events cannot be directly observed or studied in practice or in principle. The postulation of such entities is no less the product of scientific inquiry for that. Many sciences are in fact directly charged with the job of inferring the unobservable from the observable. Forces, fields, atoms, quarks, past events, mental states, subsurface geological features, molecular biological structures all are unobservables inferred from observable phenomena. Nevertheless, most are unambiguously the result of scientific inquiry.

Second, unobservability does not preclude testability: claims about unobservables are routinely tested in science indirectly against observable phenomena. That is, the existence of unobservable entities is established by testing the explanatory power that would result if a given hypothetical entity (i.e., an unobservable) were accepted as actual. This process usually involves some assessment of the established or theoretically plausible causal powers of a



given unobservable entity. In any case, many scientific theories must be evaluated indirectly by comparing their explanatory power against competing hypotheses.

During the race to elucidate the structure of the genetic molecule, both a double helix and a triple helix were considered, since both could explain the photographic images produced via x-ray crystallography. While neither structure could be observed (even indirectly through a microscope), the double helix of Watson and Crick eventually won out because it could explain other observations that the triple helix could not. The inference to one unobservable structure the double helix was accepted because it was judged to possess a greater explanatory power than its competitors with respect to a variety of relevant observations. Such attempts to infer to the best explanation, where the explanation presupposes the reality of an unobservable entity, occur frequently in many fields already regarded as scientific, including physics, geology, geophysics, molecular biology, genetics, physical chemistry, cosmology, psychology and, of course, evolutionary biology.

The prevalence of unobservables in such fields raises difficulties for defenders of descent who would use observability criteria to disqualify design. Darwinists have long defended the apparently unfalsifiable nature of their theoretical claims by reminding critics that many of the creative processes to which they refer occur at rates too slow to observe. Further, the core historical commitment of evolutionary theory that present species are related by common ancestry has an epistemological character that is very similar to many present design theories. The transitional life forms that ostensibly occupy the nodes on Darwin's branching tree of life are unobservable, just as the postulated past activity of a Designer is unobservable. Transitional life forms are theoretical postulations that make possible evolutionary accounts of present biological data. An unobservable designing agent is, similarly, postulated to explain features of life such as its information content and functional integration. Darwinian transitional, neo-Darwinian mutational events, punctualism's "rapid branching" events, the past action of a designing agent none of these are directly observable. With respect to direct observability, each of these theoretical entities is equivalent.

Each is roughly equivalent with respect to testability as well. Origins theories generally must make assertions about what happened in the past to cause present features of the universe (or the universe itself) to arise. They must reconstruct unobservable causal events from present clues or evidences. Positivistic methods of testing, therefore, that depend upon direct verification or repeated observation of cause-effect relationships have little relevance to origins theories, as Darwin himself understood. Though he complained repeatedly about the creationist failure to meet the *vera causa* criterion a nineteenth-century methodological principle that favored theories postulating observed causes he chafed at the application of rigid positivistic standards to his own theory. As he complained to Joseph Hooker: "I am actually weary of telling people that I do not pretend to adduce *direct* evidence of one species changing into another, but that I believe that this view in the main is correct because so many phenomena can be thus grouped and *explained*" (emphasis added).

Indeed, Darwin insisted that direct modes of testing were wholly irrelevant to evaluating theories of origins. Nevertheless, he did believe that critical tests could be achieved via indirect means. As he stated elsewhere: "This hypothesis [common descent] must be tested . . . by trying to see whether it explains several large and independent classes of facts; such as the geological succession of organic beings, their distribution in past and present times, and their mutual affinities and homologies." For Darwin the unobservability of past events and processes did not mean that origins theories are untestable. Instead, such theories

may be evaluated and tested indirectly by the assessment of their explanatory power with respect to a variety of relevant data or "classes of facts."

Nevertheless, if this is so it is difficult to see why the unobservability of a Designer would necessarily preclude the testability of such a postulation. Though Darwin would not have agreed, the basis of his methodological defense of descent seems to imply the possibility of a testable theory of design, since the past action of an unobservable agent could have empirical consequences in the present just as an unobservable genealogical connection between organisms does. Indeed, Darwin himself tacitly acknowledged the testability of design by his own attempts to expose the empirical inadequacy of competing creationist theories. Though Darwin rejected many creationist explanations as unscientific in principle, he attempted to show that others were incapable of explaining certain facts of biology. Thus sometimes he treated creationism as a serious scientific competitor lacking explanatory power; at other times he dismissed it as unscientific by definition.

Recent evolutionary demarcationists have contradicted themselves in the same way. The quotation cited earlier from Gerald Skoog ("The claim that life is the result of a design created by an intelligent cause can not be tested and is not within the realm of science") was followed in the same paragraph by the statement "Observations of the natural world also make these dicta [concerning the theory of intelligent design] suspect." Yet clearly something cannot be both untestable in principle and subject to refutation by empirical observations.

The preceding considerations suggest that neither evolutionary descent with modification nor intelligent design is ultimately untestable. Instead, both theories seem testable indirectly, as Darwin explained of descent, by a comparison of their explanatory power with that of their competitors. As Philip Kitcher no friend of creationism has acknowledged, the presence of unobservable elements in theories, even ones involving an unobservable Designer, does not mean that such theories cannot be evaluated empirically. He writes, "Even postulating an unobserved Creator need be no more unscientific than postulating unobserved particles. What matters is the character of the proposals and the ways in which they are articulated and defended."

Thus an unexpected equivalence emerges when design and descent are evaluated against their ability to meet specific demarcation criteria. The demand that the theoretical entities necessary to origins theories must be directly observable if they are to be considered testable and scientific would, if applied universally and disinterestedly, require the exclusion not only of design but also of descent. Those who insist on the joint criteria of observability and testability, conceived in a positivistic sense, promulgate a definition of correct science that evolutionary theory manifestly cannot meet. If, however, a less severe standard of testability is allowed, the original reason for excluding design evaporates. Here an analysis of specific attempts to apply demarcation criteria against design actually demonstrates a methodological equivalence between design and descent.

*Other demarcation criteria.* I claim that a similar equivalence between design and descent will emerge from an analysis of each of the other criteria (d) through (h) listed above. Falsification, for example, in addition to the problems mentioned in part one, seems an especially problematic standard to apply to origins theories. So does prediction. Origins theories must necessarily offer *ex post facto* reconstructions. They therefore do not make predictions in any strong sense. The somewhat artificial "predictions" that origins theories do make about, for example, what evidence one ought to find if a given theory is true are

singularly difficult to falsify since, as evolutionary paleontologists often explain, "the absence of evidence is no evidence of absence."

Similarly, the requirement that a scientific theory must provide a causal mechanism fails to provide a metaphysically neutral standard of demarcation for several reasons. First, as we have already noted, many theories in science are not mechanistic theories. Many theories that explicate what regularly happens in nature either do not or need not explain why those phenomena occur mechanically. Newton's universal law of gravitation was no less a scientific theory because Newton failed indeed refused to postulate a mechanistic cause for the regular pattern of attraction his law described. Also, as noted earlier, many historical theories about *what* happened in the past may stand on their own without any mechanistic theory about *how* the events to which such theories attest could have occurred. The theory of common descent is generally regarded as a scientific theory even though scientists have not agreed on a completely adequate mechanism to explain how transmutation between lines of descent can be achieved. In the same way, there seems little justification for asserting that the theory of continental drift became scientific only after the advent of plate tectonics. While the mechanism provided by plate tectonics certainly helped render continental drift a more persuasive theory, it was nevertheless not strictly necessary to know the mechanism by which continental drift *occurs* (1) to know or theorize that drift *had occurred* or (2) to regard the continental drift theory as scientific.

Yet one might concede that causal mechanisms are not required in all scientific contexts, but deny that origins research is such a context. One might argue that since origins theories necessarily attempt to offer causal explanations, and since design admittedly attempts to explain the origin of life or major taxonomic groups, its failure to offer a mechanism disqualifies it as an adequate theory of origins.

But this argument has difficulties as well. First, an advocate of design could concede that his theory does not provide a complete causal explanation of how life originated without forfeiting scientific status for the theory. Present clues and evidences might convince some scientists *that* intelligence played a causal role in the design of life, without those same scientists' knowing exactly *how* mind exerts its influence over matter. All that would follow in such a case is that design is an incomplete theory, not that it is an unscientific one (or even an unwarranted one). And such incompleteness is not unique to design theories. Both biological (as just discussed) and chemical evolutionary theories have often provided less than completely adequate causal scenarios. Indeed, most scientific theories of origin are causally incomplete or inadequate in some way.

In any case, asserting mechanism as necessary to the scientific status of origins theories begs the question. In particular, it assumes without justification that all scientifically acceptable causes are *mechanistic* causes. To insist that all causal explanations in science must be mechanistic is to insist that all causal theories must refer only to material entities (or their energetic equivalents). Yet this requirement is merely another expression of the very naturalism whose methodological necessity has been asserted because of ostensibly compelling demarcation arguments. Insofar as the statement "All scientific theories must be mechanistic" is a demarcation argument, this requirement is evidently circular. Science, the demarcationist claims, must be mechanistic because it must be naturalistic; it must be naturalistic because otherwise it would violate demarcation standards in particular, the standard that all scientific theories must be mechanistic.

This argument clearly assumes the point at issue, which is whether or not there are independent that is, metaphysically neutral reasons for preferring exclusively materialistic causal explanations of origins over explanations that invoke putatively immaterial entities such as creative intelligence, mind, mental action, divine action or intelligent design. While philosophical naturalists may not regard the foregoing as real or (if real) immaterial, they certainly cannot deny that such entities could function as causal antecedents if they were.

Thus we return to the central question: What noncircular reason can be offered for prohibiting the postulation of nonmechanistic (e.g., mental or intelligent) causes in scientific origins theories? Simply asserting that such entities may not be considered, whatever the empirical justification for their postulation, clearly does not constitute a justification for an exclusively naturalistic definition of science. Theoretically there are at least two possible types of causes: mechanistic and intelligent. The demarcationist has yet to offer a noncircular reason for excluding the latter type.

### **Part 3: The Methodological Character of Historical Science**

Let us now turn to a more fundamental reason for the methodological equivalence of design and descent. As stated earlier, the equivalence of design and descent follows from an understanding of the distinctive logical and methodological character of the historical sciences. An examination of scientific disciplines concerned with past events and causes, such as evolutionary biology, historical geology and archaeology, reveals a distinctive pattern of inquiry that contrasts markedly with nonhistorical sciences such as branches of chemistry, physics or biology that are concerned primarily with the discovery and explication of general phenomena. This section will show that both design and descent do, or could, instantiate this distinctive historical pattern of scientific investigation. In other words, a fundamental methodological equivalence between design and descent derives from a common concern with history--that is, with historical questions, historical inferences and historical explanations.

We can see this historical concern first by looking at why the demarcation arguments analyzed earlier fail. Consider, for example, the assertion that to be scientific one must explain by reference to natural law. To insist that "science must explain by natural law" betrays much confusion about the alleged universality of explanation in science, about the necessary role of laws in explanations and about the distinction between laws and causes. But fundamentally this demarcation criterion fails to do the work required of it by evolutionary writers because it ignores that some scientific disciplines ("historical" according to my lexicon) seek to explain events or data not primarily by reference to laws but by reference to past causal events or sequences of events what might be called "causal histories." Since natural laws are not necessary to such activity, the demarcation criterion "must explain by natural law" can't be used to distinguish between two competing programs of historical scientific research, whether evolutionary or otherwise.

Next consider the idea that scientific theories must not postulate unverifiable or unobservable entities. Certainly this criterion is untenable in light of many fields, not the least of which is modern physics. Yet it is completely irrelevant to historical study almost in principle. All historical theories depend on what C. S. Peirce called "abductive inferences." Such inferences frequently posit unobservable past events in order to explain present phenomena, facts or clues. Making a claim about history nearly always involves postulating, invoking, or inferring an unobservable event or entity that cannot be studied directly. The attempt to distinguish the

methodological merit of competing origins theories on the basis of unobservables therefore seems quite misguided and futile.

Finally, consider the claim that to be scientific a theory must be testable. As we saw above, neither design nor descent can meet standards of testability that require strict verifiability. I have also emphasized that neither can meet standards of testability that depend on notions of repeatability. Yet both can meet alternate standards of testability, such as inference to the best explanation or "consilience," that involve notions of comparative explanatory power. This equivalence was suggested again from the historical nature of the claims that design and evolutionary theorists make. Like other historical theorists, both make claims about events they believe occurred in the past that cannot be directly verified and may never recur. Yet like other historical theories, these theories can be tested after the fact by reference to their comparative explanatory power. To impose stricter standards ignores the limitations inherent in all historical inquiry and thus again fails to provide grounds for distinguishing the status of competing historical or origins theories.

So the evolutionary demarcation arguments above seem to fail in part because they attempt to impose (as normative) criteria of method that ignore the historical character of origins research. Indeed, each one of the demarcationist arguments listed above fails because it overlooks a specific characteristic of the historical sciences. But what are these characteristics? And could *they* provide grounds for distinguishing the scientific, or at least methodological, status of design and descent?

*The nature of historical science.* Answering these questions will require briefly summarizing the results of my doctoral research on the logical and methodological features of the historical sciences. Through that research I have identified three general features of historical scientific disciplines. These features derive from a concern to reconstruct the past and to explain the present by reference to the past. They distinguish disciplines motivated by historical concerns from disciplines motivated by a concern to discover, classify or explain unchanging laws and properties of nature. These latter disciplines may be called "inductive" or "nomological" (from the Greek word *nomos*, for law); the former type may be called "historical." I contend that historical sciences generally can be distinguished from nonhistorical scientific disciplines by virtue of the three following features:

1. The historical interest or questions motivating their practitioners: Those in the historical sciences generally seek to answer questions of the form "What happened?" or "What caused this event or that natural feature to arise?" On the other hand, those in the nomological or inductive sciences generally address questions of the form "How does nature normally operate or function?"
2. The distinctively historical types of inference used: The historical sciences use inferences with a distinctive logical form. Unlike many nonhistorical disciplines, which typically attempt to infer generalizations or laws from particular facts, historical sciences make what C. S. Peirce has called "abductive inferences" in order to infer a past event from a present fact or clue. These inferences have also been called "retrodictive" because they are temporally asymmetric that is, they seek to reconstruct past conditions or causes from present facts or clues. For example, detectives use abductive or retrodictive inferences to reconstruct the circumstances of a crime after the fact. In so doing they function as historical scientists. As Gould has put it, the historical scientist proceeds by "inferring history from its results."

3. The distinctively historical types of explanations used: In the historical sciences one finds causal explanations of particular events, not nomological descriptions or theories of general phenomena. In historical explanations, past causal events, not laws, do the primary explanatory work. The explanations cited earlier of the Himalayan orogeny and the beginning of World War I exemplify such historical explanations.

In addition, the historical sciences share with many other types of science a fourth feature.

4. Indirect methods of testing such as inference to the best explanation: As discussed earlier, many disciplines cannot test theories by direct observation, prediction or repeated experiment. Instead, testing must be done indirectly through comparison of the explanatory power of competing theories.

*Descent as historical science.* Enough has been said previously--about the function of common descent as an explanatory causal history, the retrodictive character of Darwin's inference of common descent and his use of indirect methods of theory evaluation--to suggest that evolutionary research programs conform closely to the general methodological pattern of the historical sciences. But a few additional observations may make this connection more explicit.

With respect to the first characteristic of historical science enumerated above (historical motive or purpose), Darwin clearly was motivated by such a purpose. One of Darwin's primary goals in the *Origin of Species* was to establish a historical pointnamely, that species had not originated independently but had derived via transmutation from one or very few common ancestors. Indeed, Darwin sought to show that the history of life resembled a single, continuous branching tree, with the first and simplest living forms represented by the base of a tree and the great diversity of more complex forms, both past and present, represented by the connecting branches. This picture of biological history contrasted markedly with that of his creationist opponents, who envisioned the history of life as an array of parallel (nonconvergent) lines of descent. Darwin's (perhaps primary) purpose in the *Origin of Species* was to argue for this continuous view of life's history as opposed to the discontinuous view favored by his creationist opponents.

Thus he would repeatedly explicate his priorities in such a way as to show the primacy of his concern to demonstrate the historical thesis of common descent, even over his concern to establish the efficacy of his proposed mechanism, natural selection. He himself tells us what he had in mind: "I had two distinct objects in view; *firstly* to shew that species had not been separately created [i.e., that they had evolved from common ancestors], and *second*, that natural selection had been the chief agent of change" (emphasis added).

Similarly, at the close of his chapter 13 Darwin states the priorities of his argument by concluding: "The several classes of facts which have been considered . . . proclaim so plainly that the innumerable species, genera, and families with which the world is peopled are all *descended* . . . from common parents and have been modified in the course of descent, that I should without hesitation adopt this view, *even if* it were unsupported by other facts or arguments" (emphasis added).

Not only was Darwin motivated by a historical purpose, but he also used (concerning feature 2 above) a characteristically historical mode of reasoning. As Gould has argued so

persuasively, Darwin used historical inferences. Beginning in the middle of his chapter on the "Geological Succession of Organic Beings" and continuing through his next three chapters, Darwin offered a series of arguments to support his historical claim of common descent. These arguments are instances of retrodictive or abductive reasoning. In each case, extant evidence from the fossil record, comparative anatomy, embryology and biogeography were used as clues from which to infer a pattern of past biohistorical events. Notice, for example, the language Darwin uses in his argument from vestigial structures: "Rudimentary organs may be compared with the letters in a word, still retained in the spelling but become useless in the pronunciation, but *which serve as a clue in seeking for its derivation.*"

Notice, too, the temporally asymmetric character of each of the inferences he employs: "The several *classes of facts* which have been considered . . . proclaim so plainly that the innumerable species, genera, and families with which the world is peopled are all *descended*, each within its own class or group, *from common parents.*" As Gould has written, Darwin used a method of "inferring history from its results."

Darwin not only inferred an historical past, but (with respect to feature 3 above) he also formulated historical explanations. Indeed, a reciprocal relationship exists between historical inferences and explanations. Historical scientists will often seek to infer causal antecedents that, if true, would explain the widest class of relevant data. The causal past inferred on the basis of its potential to explain will often serve, when accepted, as an explanation. Darwin repeatedly argued that the supposition that all organisms descended from common parents should be accepted because it "explains several large and independent classes of facts." Moreover, common descent (and the past events implied by it) served as a *causal* explanation for Darwin. He refers to "propinquity of descent" as "*the only known cause* of the similarity of organic beings." Elsewhere he refers to common descent or "propinquity of descent" as the *vera causa* (or true cause) of organic similarity. By inferring descent as a past cause, Darwin constructed a historical explanation in which a pattern of past events did the primary explanatory work in relation to the facts of biogeography, fossil progression, homology and so on. As Gould has put it, the *Origin of Species* makes "the claim that *history* stands as the coordinating reason for relationships among organisms."

The explanatory function of antecedent events and causal histories is perhaps even more readily apparent in the work of many chemical evolutionary theorists. Alexander Oparin, Russian scientist and father of modern origin-of-life research, formulated detailed causal histories involving a sequence of hypothetical past events to explain how life emerged in its present form. The formulation of these "scenarios," as they are called in origin-of-life biology, has remained an important part of origin-of-life studies to the present. Thus evolutionary biologists employ not only historical inferences but also historical explanations in which past causal events, or patterns thereof, serve to explain the origin of present facts.

As already discussed, Darwin also (with respect to feature 4 above) employed a method of indirect testing of his theory by assessing its relative explanatory power. Recall his statement that "this hypothesis [i.e., common descent] must be tested . . . by trying to see whether it explains several large and independent classes of facts" He makes this indirect and comparative method of testing even more explicit in a letter to Asa Gray:

I . . . test this hypothesis [common descent] by comparison with as many general and pretty well-established propositions as I can find--in geographical distribution, geological history, affinities &c., &c. And it seems to me

that, *supposing* that such a hypothesis were to explain such general propositions, we ought, in accordance with the common way of following all sciences, to admit it till some *better* hypothesis be found out. (emphasis added)

*Design as historical science.* The foregoing suggests that evolutionary biology, or at least Darwin's version of it, does conform to the pattern of inquiry described above as historically scientific. To show that design and descent are methodologically equivalent with respect to the historical mode of inquiry outlined above, it now remains to show that a design argument or theory could exemplify this same historical pattern of inquiry.

In the case of feature 1 this equivalence is quite obvious. As just noted, a clear logical distinction exists between questions of the form "How does nature normally operate or function?" and those of the form "How did this or that natural feature arise?" or "What caused this or that event to occur?" Those who postulate the past activity of an intelligent Designer do so as an answer, or partial answer, to questions of the latter historical type. Whatever the evidential merits or liabilities of design theories, such theories undoubtedly represent attempts to answer questions about what caused certain features in the natural world to come into existence. With respect to an interest in origins questions, design and descent are clearly equivalent.

Design and descent are also equivalent with respect to feature 2. Inferences to intelligent design are clearly abductive and retrodictive. They seek to infer a past unobservable cause (an instance of creative mental action or agency) from present facts or clues in the natural world such as the information content of DNA, the functional coadaptation of biomolecules, the sudden appearance of a new form in the fossil record, the uniqueness of human language and the hierarchical organization of biological systems. Moreover, just as Darwin sought to strengthen the retrodictive inferences that he made by showing that many facts or classes of facts could be explained on the supposition of descent, so too may proponents of design seek to muster a wide variety of clues to demonstrate the explanatory power of their theory. In the second half of this volume, for example, evidence from at least four distinct domains of the natural world will be cited to demonstrate the explanatory power (or "consilience") of the design inference.

With respect to feature 3, design inferences, once made, may also serve as causal explanations. The same reciprocal relationship between inference and explanation that exists in arguments for descent can exist in arguments for design. Thus, as noted, an inference to intelligent design may gain support because it could, if accepted, explain many diverse classes of facts. Clearly, once adopted it will provide corresponding explanatory resources. Moreover, theories of design involving the special creative act of an agent conceptualize that act as a causal event, albeit involving mental rather than purely physical antecedents. Indeed, design theories--whether posited by young-earth Genesis literalists, old-earth progressive creationists, theistic macromutationalists or religiously agnostic biologists--refer to antecedent causal events or express some kind of causal scenario just as, for example, chemical evolutionary theories do. As a matter of method, advocates of design and descent alike seek to postulate antecedent causal events or event scenarios in order to explain the origin of present phenomena. With respect to feature 3, design and descent again appear methodologically equivalent.

Much has already been said to suggest that with respect to feature 4 design may be tested indirectly in the same way as descent. Certainly, advocates of design may seek to test their



ideas as Darwin did--against a wide class of relevant facts and by comparing the explanatory power of their hypotheses against competitors'. Indeed, many biologists who favor design now make their case for it on the basis of its ability to explain the same evidences that descent can as well as some that descent allegedly cannot (such as the presence of sequentially encoded information in DNA).

Thus design and descent again seem methodologically equivalent. Both seek to answer characteristically historical questions, both rely upon abductive inferences, both postulate antecedent causal events or scenarios as explanations of present data, and both are tested indirectly by comparing their explanatory power against that of competing theories.

*A theory of everything?* Yet before one is willing to concede this methodological equivalence, one might demand to know that design can really function as a valid explanation without trivializing scientific inquiry. The perennial worry about allowing theories of design, of course, concerns not their explanatory power but the inability to constrain that power. This concern lies behind some secular scientists' worry that a theory of design would leave them nothing to do, since presumably the phrase "God did it" could be invoked as the answer to every scientific question. As David Hull wrote recently, "Scientists have no choice [but to define science as totally naturalistic]. Once they allow reference to God or miraculous forces to explain the first origin of life or the evolution of the human species, they have no way of limiting this sort of explanation." This worry also finds expression in the familiar theistic worry about embarrassing "God-of-the-gaps" arguments, as J. P. Moreland pointed out in chapter one. So both theists and secularists may worry: "If design is allowed as a (historically) scientific theory, couldn't it be invoked at every turn as a theoretical panacea, stultifying inquiry as it goes? Might not design become a refuge for the intellectually lazy who have refused to study what nature actually does?"

Well, of course it might. But so might the incantation "Evolution accomplished X." Nevertheless, design need not stultify inquiry, nor can it be offered appropriately in every context as a theoretical panacea. The distinction between the historical sciences and the nomological or inductive sciences helps to explain why. Indeed, it helps to show how design can be both legitimated (as a possible historical explanation) and at the same time constrained or even prohibited, depending on the context of inquiry. In other words, the distinction between the historical and the nomological helps to show why the past action of an intelligent agent may serve as a legitimate explanation in the historical sciences, whereas it would not in many nonhistorical scientific contexts.

When a research program concentrates on questions of how nature normally (unassisted by the special activity of agency) operates, any reference to agency (whether divine or human) becomes inappropriate because it fails to address the question motivating the inquiry. A geologist who inquires about the stress-strain relationship of a particular type of rock at various temperatures will rightly regard the postulation of God's creative activity (or, for that matter, a corresponding evolutionary scenario) as irrelevant to her inquiry. As noted above, nomological or inductive scientific endeavor typically seeks to infer or explain general nomological relations (i.e., scientific laws), whereas historical sciences typically infer past causal events. To propose the action of agency (as an event in space and time) when a law is required simply misses the context and character of nomological inquiry. Neither divine nor human action qualifies as a law. To offer either when a law is sought is syntactically inappropriate. To offer "God did it" as an answer to a question such as "How does weightlessness generally affect crystal growth?" clearly misses the point of the question. The

answer does not so much violate the rules of science as the rules of grammar. Such an answer not only stultifies inquiry but misses the point of such inquiry altogether.

It does not follow, however, that references to agency are necessarily inappropriate when we are reconstructing a causal history that is, when we are attempting to answer questions about how a particular feature in the natural world (or the universe itself) arose. In the first place, classical examples of inappropriate postulations of divine activity (God-of-the-gaps arguments) occur almost exclusively in the inductive or nomological sciences, as Newton's ill-fated use of agency to provide a more accurate description of planetary motion suggests. Second, many fields of inquiry routinely invoke the action of agents to account for the origin of features or events within the natural world. Forensic science, history and archaeology, for example, all sometimes postulate the past activity of human agents to account for the emergence of particular objects or events. Several such fields suggest a clear precedent for inferring the past causal activity of intelligent agents within the historical sciences. Imagine the absurdity of someone's claiming that scientific method had been violated by the archaeologist who first inferred that French cave paintings had been produced by human beings rather than by natural forces such as wind and erosion.

There is another, more fundamental reason that postulating the past action of agency can be appropriate in the historical sciences. That again has to do with the nature of historical explanations. As already noted, historical explanations require the postulation of antecedent causal events; they do not seek to infer laws. To offer past agency as part of a historical explanation is therefore logically and syntactically appropriate. The type of theoretical entity provided--a past causal event--corresponds to the type required by historical explanations. Simply put, past agency is a causal event. Agency, therefore, whether seen or unseen, may serve as a logically and syntactically appropriate theoretical entity in a historical explanation, even if it could not do so in a nomological or inductive theory. Mental action may be a cause, even if it is certainly not a law.

In any case, postulations of design are constrained by background knowledge about the causal powers and proclivities of both nature and agency. In addition to the features of historical explanation mentioned already, successful historical explanations (as I have discussed elsewhere) must usually meet independent criteria of causal adequacy. This criterion, which seems to function normatively in much historical scientific practice, expresses the idea that postulated causal antecedents should generally be known to be capable of producing the relevant *explanandum*--that is, the event or object requiring explanation. In other words, before a cause can be postulated to have been present in the past, one should know that some causal precedent (which is not the same thing as knowing a law) exists for believing the cause capable of producing the effect of interest. Intelligent design can be offered, therefore, as a necessary or best causal explanation only when naturalistic processes seem incapable of producing the *explanandum* effect, and when intelligence is known to be capable of producing it and thought to be more likely to have produced it. Thus modern scientific advocates of design such as Charles Thaxton or Walter Bradley (see their chapter in this present volume) insist that they postulate antecedent intelligent activity not because of what we do not know but because of what we *do* know about what is and is not capable of producing coded information. Conversely, there are many effects that do not, based on our present background knowledge of causal powers, suggest design as a necessary, best or most likely historical explanation.

Postulations of design are constrained in yet another way. There are many particular events, even in history, for which design could not be considered the best or most likely explanation. The reason for this is that postulations of intelligent design are constrained by background assumptions about the proclivities of potential designing agents, both human and divine. Most biblical theists, for example, assume that God acts in at least two ways: (1) through the natural regularities or laws that he upholds and sustains through his invisible power and (2) through more dramatic, discernible and discrete actions at particular points in time. Because theists assume that the second mode of divine action is by far the rarer and usually associated with the accomplishment of some particular divine purpose on behalf of human beings (e.g., creation or redemption), they assume that divine action of the second variety will be unlikely as an explanation of most particular events. In philosophical terms, theists generally approach their study of nature with a set of background assumptions that would lead them to regard most hypotheses of divine action as unlikely, though not completely impossible. Theism itself constrains design inferences. Thus theistic background assumptions would generally allow consideration of special divine action as the best or most likely explanation for a particular event only when it seemed empirically warranted *and theologically plausible*. Nevertheless, given a biblical (though not necessarily literalist) understanding of creation and sufficient empirical justification, there is no reason to believe that both these conditions could not be met in some cases, as with, for example, explanations of the origin of life, human consciousness and the universe.

The above considerations suggest that allowing the design hypothesis as the best explanation for some events in the history of the cosmos will not cause science to grind to a halt. While design does have the required logical and syntactic features of some scientific (i.e., historical) explanations, it cannot be invoked appropriately in all scientific contexts. Furthermore, because effective postulations of design are constrained by empirical considerations of causal precedence and adequacy and by extraevidential considerations such as simplicity and theological plausibility, concerns about design theory functioning as a "theory of everything" or "providing cover for ignorance" or "putting scientists out of work" can be shown to be largely unfounded. Many important scientific questions would remain to be answered if one adopted a theory of design. Indeed, *all* questions about how nature normally operates without the special assistance of agency remain unaffected by whatever view of origins one adopts. And that, perhaps, is yet another equivalence between design and descent.

### **Conclusion: Toward a Scientific Theory of Creation**

So what should we make of these methodological equivalencies? Can there be a scientific theory of intelligent design? At the very least it seems we can conclude that we have not yet encountered any good in principle reason to *exclude* design from science. Design seems to be just as scientific (or unscientific) as its evolutionary competitors when judged according to the methodological criteria examined above. Moreover, if the antidemarcationists are correct, our lack of universal demarcation criteria implies there cannot be a negative a priori case against the scientific status of design--precisely because there is not an agreed standard as to what constitutes the properly scientific. To say that some discipline or activity qualifies as scientific is to imply the existence of a standard by which the scientific status of an activity or discipline can be assessed or adjudicated. If no such standard presently exists, then nothing positive (or negative) can be said about the scientific status of intelligent design (or any other theory for that matter).

But there is another approach that can be taken to the question. If (1) there exists a distinctively historical pattern of inquiry, and (2) a program of origins research committed to design theory could or does instantiate that pattern, and (3) many other fields such as evolutionary biology also instantiate that pattern, and (4) these other fields are already regarded by convention as science, there can be a very legitimate if convention-dependent sense in which design may be considered scientific. In other words, the conjunction of the methodological equivalence of design and descent and the existence of a convention that regards descent as scientific implies that design should by that same convention be regarded as scientific too. Thus, one might quite legitimately say that both design and descent are historically scientific research programs, since they instantiate the same pattern of inquiry.

Perhaps, however, one just really does not want to call intelligent design a scientific theory. Perhaps one prefers the designation "quasi-scientific historical speculation with strong metaphysical overtones." Fine. Call it what you will, provided the same appellation is applied to other forms of inquiry that have the same methodological and logical character and limitations. In particular, make sure both design and descent are called "quasi-scientific historical speculation with strong metaphysical overtones."

This may seem all very pointless, but that in a way is just the point. As Laudan has argued, the question whether a theory is scientific is really a red herring. What we want to know is not whether a theory is scientific but whether a theory is true or false, well confirmed or not, worthy of our belief or not. One can not decide the truth of a theory or the warrant for believing a theory to be true by applying a set of abstract criteria that purport to tell in advance how all good scientific theories are constructed or what they will in general look like.

*Against method?* Now none of the above should be construed to imply that methodology does not matter. The purpose of this essay is not to argue, as Paul Feyerabend does, against method. Methodological standards in science can be important for guiding future inquiry along paths that have been successful in the past. The uniformitarian and/or actualistic method in the historical sciences, for example, has proved a very helpful guide to reconstructing the past, even if it can't be used as demarcation between science and pseudoscience, and even if some theories constructed according to its guidelines turn out to be false.

Standards of method may also express some minimal logical and epistemic conditions of success—for example, the conditions related to causal explanation. Successful causal explanations must as a condition of logical sufficiency cite more than just a necessary condition of a given outcome. To explain why a given explosion occurred, it will not suffice to note that oxygen was present in the atmosphere; nor can the death of a patient be explained simply by citing the patient's birth, though clearly birth is necessary to death. These cases illustrate how methodological guidelines (whether tacit or explicit) can help eliminate certain (in this case logically) inadequate hypotheses, even if such guidelines cannot be used to define science exhaustively. Methodological anarchism need not result from a rejection of methodological demarcation arguments.

Nevertheless, following methodological criteria and recipes (of any of the preceding types) does not guarantee theoretical success; nor, again, can such recipes be used to define science exhaustively, if for no other reason than the variety of scientific methods that exist. Moreover, methodological recipes can sometimes become fatal to the success of inquiry if they so dictate the content of acceptable theorizing that they automatically eliminate empirically and logically possible explanations or theories.

And this, I believe, has occurred within origins research. The deployment of flawed or metaphysically tendentious demarcation arguments against legitimate theoretical contenders has produced an unjustified confidence in the epistemic standing of much evolutionary dogma, including "the fact of evolution" defined as common descent. If competing hypotheses are eliminated before they are evaluated, remaining theories may acquire an undeserved dominance.

So the question isn't whether there can be a scientific theory of design or creation. The question is whether design should be considered as a competing hypothesis alongside descent in serious origins research (call it what you will). Once issues of demarcation are firmly behind us, understood as the red herrings they are, the answer to this question *must* clearly be yes that is, if origins biology is to have standing as a fully rational enterprise, rather than just a game played according to rules convenient to philosophical materialists.

*Naturalism: the only game in town?* G. K. Chesterton once said that "behind every double standard lies a single hidden agenda." Advocates of descent have used demarcation arguments to erect double standards against design, suggesting that the real methodological criterion they have in mind is naturalism. Of course for many the equation of science with the strictly materialistic or naturalistic is not at all a hidden agenda. Scientists generally treat "naturalistic" as perhaps the most important feature of their enterprise. Clearly, if naturalism is regarded as a necessary feature of all scientific hypotheses, then design will not be considered a scientific hypothesis.

But must all scientific hypotheses be entirely naturalistic? Must scientific origins theories, in particular, limit themselves to materialistic causes? Thus far none of the arguments advanced in support of a naturalistic definition of science has provided a noncircular justification for such a limitation. Nevertheless, perhaps such arguments are irrelevant. Perhaps scientists should just accept the definition of science that has come down to them. After all, the search for natural causes has served science well. What harm can come from continuing with the status quo? What compelling reasons can be offered for overturning the prohibition against nonnaturalistic explanation in science?

In fact, there are several. First, with respect to origins, defining science as a strictly naturalistic enterprise is metaphysically gratuitous. Consider: It is at least logically possible that a personal agent existed before the appearance of the first life on earth. Further, as Bill Dembski argues in the next chapter, we do live in the sort of world where knowledge of such an agent could possibly be known or inferred from empirical data. This suggests that it is logically and empirically possible that such an agent (whether divine or otherwise) designed or influenced the origin of life on earth. To insist that postulations of past agency are inherently unscientific in the historical sciences (where the express purpose of such inquiry is to determine what happened in the past) suggests we know that no personal agent could have existed prior to humans. Not only is such an assumption intrinsically unverifiable, it seems entirely gratuitous in the absence of some noncircular account of why science should presuppose metaphysical naturalism.

Second, to exclude by assumption a logically and empirically possible answer to the question motivating historical science seems intellectually and theoretically limiting, especially since no equivalent prohibition exists on the possible nomological relationships that scientists may postulate in nonhistorical sciences. The (historical) question that must be asked about biological origins is not "Which materialistic scenario will prove most adequate?" but "How

did life as we know it actually arise on earth?" Since one of the logically and syntactically appropriate answers to this later question is "Life was designed by an intelligent agent that existed before the advent of humans," it seems rationally stultifying to exclude the design hypothesis without a consideration of all the evidence, including the most current evidence, that might support it.

The a priori exclusion of design diminishes the rationality of origins research in another way. Recent nonpositivistic accounts of scientific rationality suggest that scientific theory evaluation is an inherently comparative enterprise. Notions such as consilience and Peter Lipton's inference to the best explanation discussed above imply the need to compare the explanatory power of competing hypotheses or theories. If this process is subverted by philosophical gerrymandering, the rationality of scientific practice is vitiated. Theories that gain acceptance in artificially constrained competitions can claim to be neither "most probably true" nor "most empirically adequate." Instead such theories can only be considered "most probable or adequate among an artificially limited set of options."

Moreover, where origins are concerned only a limited number of basic research programs are logically possible. (Either brute matter has the capability to arrange itself into higher levels of complexity or it does not. If it does not, then either some external agency has assisted the arrangement of matter or matter has always possessed its present arrangement.) The exclusion of one of the logically possible programs of origins research by assumption, therefore, seriously diminishes the significance of any claim to theoretical superiority by advocates of a remaining program. As Phillip Johnson has argued, the use of "methodological rules" to protect Darwinism from theoretical challenge has produced a situation in which Darwinist claims must be regarded as little more than tautologies expressing the deductive consequences of methodological naturalism.

An openness to empirical arguments for design is therefore a necessary condition of a fully rational historical biology. A rational historical biology must not only address the question "Which materialistic or naturalistic evolutionary scenario provides the most adequate explanation of biological complexity?" but also the question "Does a strictly materialistic evolutionary scenario or one involving intelligent agency or some other theory best explain the origin of biological complexity, given all relevant evidence?" To insist otherwise is to insist that materialism holds a metaphysically privileged position. Since there seems no reason to concede that assumption, I see no reason to concede that origins theories must be strictly naturalistic.

## **Acknowledgments**

For helpful comments and criticisms I would like to thank Ed Olson, Forrest Baird, Dale Bruner, Bill Dembski, Norman Krebs, J. P. Moreland, Paul Nelson and Jitse van der Meer. For assistance with typing references I would like to thank Lorrie Nelson. For generous research support I thank the Pascal Centre in Ontario, Canada, and C. Davis Weyerhaeuser.

## **Bibliography**

### ***Books***

Ambrose, E. J. *The Nature and Origin of the Biological World*. New York: Halstead, 1982.  
[A]

- Augros, R., and G. Stanciu. *The New Biology*. Boston: Shambhala, 1987. [B]
- Barrow, John D., and Frank J. Tipler. *The Anthropic Principle and the Structure of the Physical World*. New York: Oxford University Press, 1986. [A]
- Brooks, Daniel R., and E. O. Wiley. *Entropy and Evolution*. Chicago: University of Chicago Press, 1985. [A]
- Cairns-Smith, A. G. *Genetic Takeover and the Mineral Origins of Life*. Cambridge, U.K.: Cambridge University Press, 1982. [I] ..... *Seven Clues to the Origin of Life*. Cambridge, U.K.: Cambridge University Press, 1986. [B]
- Chesterton, G. K. *Orthodoxy*. London: John Lane, 1909. [I]
- Crick, F. *Life Itself*. New York: Simon and Schuster, 1981. [B]
- Darwin, Charles. *The Descent of Man*. 2nd ed. New York: A. L. Burt, 1874. [I] ..... *The Origin of Species by Means of Natural Selection*. 1859; rpt. Harmondsworth, U.K.: Penguin, 1984. [I] Darwin, F., ed. *Life and Letters of Charles Darwin*. 2 vols. London: D. Appleton, 1896. [I] ..... *More Letters of Charles Darwin*. 2 vols. London: Murray, 1903. [I]
- De Beer, G. *Homology: An Unsolved Problem*. London: Oxford University Press, 1971. [A]
- Denton, Michael. *Evolution: A Theory in Crisis*. London: Adler and Adler, 1986. [I]
- Ebert, James, et al. *Science and Creationism: A View from the National Academy of Science*. Washington, D.C.: National Academy Press, 1987. [B]
- Eldredge, Niles. *Time Frames: The Evolution of Punctuated Equilibria*. Princeton, N.J.: Princeton University Press, 1985. [A]
- Fann, K. T. *Peirce's Theory of Abduction*. The Hague: Martinus Nijhoff, 1970. [A]
- Feyerabend, Paul. *Against Method*. London: Verso, 1978. [A]
- Fox, S. W., and K. Dose. *Molecular Evolution and the Origin of Life*. San Francisco: W. H. Freeman, 1972. [A]
- Futuyma, Douglas J. *Science on Trial*. New York: Pantheon Books, 1983. [I]
- Gillespie, N. C. *Charles Darwin and the Problem with Creation*. Chicago: University of Chicago Press, 1979. [A]
- Graham, G. *Historical Explanation Reconsidered*. Aberdeen: Aberdeen University Press, 1983. [A]
- Grasse, P. P. *Evolution of Living Organisms*. New York: Academic, 1977. [A]
- Greenstein, George. *The Symbiotic Universe: Life and Mind in the Cosmos*. New York: Morrow, 1988. [I]

- Gribbin, J., and M. Rees. *Cosmic Coincidences*. London: Black Swan, 1991. [I]
- Haeckel, Ernst. *The Wonders of Life*. London: Watts, 1905. [I]
- Ho, Wing Meng. "Methodological Issues in Evolutionary Theory." D.Phil. thesis, Oxford University, 1965. [A]
- Hoyle, F., and S. Wickramasinghe. *Evolution from Space*. London: J. M. Dent, 1981. [I]
- Hull, David L. *Darwin and His Critics*. Chicago: University of Chicago Press, 1973. [A]
- Johnson, Phillip E. *Darwin on Trial*. 2nd ed. Downers Grove, Ill.: InterVarsity Press, 1993. [I]
- Judson, H. *The Eighth Day of Creation*. New York: Simon and Schuster, 1979. [A]
- Kauffman, S. *The Origins of Order*. Oxford, U.K.: Oxford University Press, 1992. [A]
- Kavalovski, V. "The *Vera Causa* Principle: A Historico-Philosophical Study of a Meta-theoretical Concept from Newton Through Darwin." Ph.D. dissertation, University of Chicago, 1974. [A]
- Kenyon, D., and P. W. Davis. *Of Pandas and People: The Central Question of Biological Origins*. Dallas: Haughton, 1993. [I]
- Kitcher, Philip. *Abusing Science*. Cambridge, Mass.: MIT Press, 1982. [I]
- Kuppers, B. *Information and the Origin of Life*. Cambridge, Mass.: MIT Press, 1990. [A]
- Lenior, Timothy. *The Strategy of Life*. Chicago: University of Chicago Press, 1982. [A]
- Lewis, C. S. *God in the Dock*. London: Collins, 1979. [B]
- Lipton, Peter. *Inference to the Best Explanation*. London: Routledge, 1991. [I]
- Lovtrup, So/ren. *Darwinism: The Refutation of Myth*. Beckingham, Kent, U.K.: Croom Helm, 1987. [I]
- Meyer, Stephen C. "Of Clues and Causes: A Methodological Interpretation of Origin of Life Studies." Ph.D. thesis, Cambridge University, 1990. [A]
- Morowitz, H. J. *Energy Flow in Biology*. New York: Academic, 1968. [A]
- Newton, Isaac. *Isaac Newton's Papers and Letters on Natural Philosophy*. Edited by I. Bernard Cohen. Cambridge, Mass.: Harvard University Press, 1958. [A]
- Oparin, A. I. *The Origin of Life*. Translated by S. Morgulis. New York: Macmillan, 1938. [I]
- Peirce, C. S. *Collected Papers*. Edited by C. Hartshorne and P. Weiss. 6 vols. Cambridge, Mass.: Harvard University Press, 1931. [A]



Prigogine, I., and G. Nicolis. *Self Organization in Nonequilibrium Systems*. New York: Wiley, 1977. [A]

Ridley, Mark. *The Problems of Evolution*. Oxford, U.K.: Oxford University Press, 1985. [B]

Ruse, Michael. *Darwinism Defended: A Guide to the Evolution Controversies*. London: Addison-Wesley, 1982. [I] ..... . *The Philosophy of Biology*. London: Hutchinson's University Library, 1973. [B]

Shapiro, R. *Origins*. London: Heinemann, 1986. [B]

Sober, E. *Reconstructing the Past*. Cambridge, Mass.: MIT Press, 1988. [A]

Swinburne, Richard. *The Concept of a Miracle*. London: Macmillan, 1970. [A]

Tetry, Andree. *A General History of the Sciences*, vol. 4. London: Thames and Hudson, 1966. [I]

Thaxton, Charles, Walter L. Bradley and Roger Olsen. *The Mystery of Life's Origin*. New York: Philosophical Library, 1984. [A]

Whewell, William. *The Philosophy of the Inductive Sciences*. 2 vols. London: Parker, 1840. [A]

Wicken, J. *Evolution, Thermodynamics and Information*. Oxford, U.K.: Oxford University Press, 1987. [A]

Yockey, H. P. *Information Theory and Molecular Biology*. Cambridge, U.K.: Cambridge University Press, 1992. [A]

### ***Articles in Journals***

Alston, W. P. "The Place of the Explanation of Particular Facts in Science." *Philosophy of Science* 38 (1971): 13-34. [A]

Beade, Pedro. "Falsification and Falsifiability in Historical Linguistics." *Philosophy of the Social Sciences* 19 (1989): 173-81. [A]

Bradley, Walter L. "Thermodynamics and the Origin of Life." *Perspectives on Science and Christian Faith* 40, no. 2 (1988): 72-83. [I]

Brady, R. H. "Dogma and Doubt." *Biological Journal of the Linnean Society* 17 (1982): 79-96. [I]

Cairns-Smith, A. G. "The First Organisms." *Scientific American*, June 1985, pp. 90-100. [I]

Carr, B. J., and M. J. Rees. "The Anthropic Principle and the Structure of the Physical World." *Nature* 278 (1979): 610. [A]

Cech, Thomas R. "Ribozyme Self-Replication?" *Nature* 339 (1989): 507-8. [A]

Collingridge, D., and M. Eashy. "Science Under Stress: Crisis in Neo-Darwinism." *History and Philosophy of the Life Sciences* 12 (1990): 3-26. [I]

Colwell, Gary. "On Defining Away the Miraculous." *Philosophy* 57 (1982): 327-37. [A]

Crick, F. "The Origin of the Genetic Code." *Journal of Molecular Biology* 38 (1968): 367-79. [A]

Crick, F., and L. Orgel. "Directed Panspermia." *Icarus* 19 (1973): 341-46. [I]

Dickerson, R. E. "Chemical Evolution and the Origin of Life." *Scientific American* 239 (1978): 70-85. [I]

Dose, K. "The Origin of Life: More Questions Than Answers." *Interdisciplinary Science Review* 13 (1988): 348-56. [I]

Eger, Martin. "A Tale of Two Controversies: Dissonance in the Theory and Practice of Rationality." *Zygon* 23 (1988): 291-326. [A]

Eigen, M., W. Gardner, P. Schuster and R. Winkler-Oswatitich. "The Origin of Genetic Information." *Scientific American* 244 (1981): 88-118. [I]

Gingerich, Owen. "The Galileo Affair." *Scientific American*, August 1982, pp. 133-43. [I]

Gould, Stephen Jay. "Darwinism Defined: The Difference Between Theory and Fact." *Discovery*, January 1987, pp. 64-70. [B] ..... "Evolution and the Triumph of Homology: Or, Why History Matters." *American Scientist* 74 (1986): 60-69. [B] ..... "Is a New Theory of Evolution Emerging?" *Paleobiology* 6 (1980): 119-30. [A]

Grizzle, Raymond. "Some Comments on the 'Godless' Nature of Darwinian Evolution, and a Plea to the Philosophers Among Us." *Perspectives on Science and Christian Faith* 44 (1993): 175-77. [B]

Hempel, C. "The Function of General Laws in History." *Journal of Philosophy* 39 (1942): 35-48. [I]

Hoyle, Fred. "The Universe: Past and Present Reflections." *Annual Review of Astronomy and Astrophysics* 20 (1982): 16. [I]

Hull, David. "God of the Gaps." *Nature* 352 (1991): 485-86. [B]

Huxley, T. H. "Biogenesis and Abiogenesis" (presidential address to the British Association of the Advancement of Science for 1870). *Discourses: Biological and Geological* 8 (1896): 229-71. [I] ..... "On the Physical Basis of Life." *The Fortnightly Review* 5 (1869): 129-45. [I]

Kenyon, D. "The Creationist View of Biological Origins." *NEXA Journal*, Spring 1984, pp. 28-35. [I] ..... "Going Beyond the Naturalistic Mindset in Origin-of-Life Research." Paper presented to Conference on Christianity and the University, Dallas, February 9-10, 1985. [I]

- Kenyon, D., and A. Nissenbaum. "On the Possible Role of Organic Melanoidin Polymers as Matrices for Prebiotic Activity." *Journal of Molecular Evolution* 7 (1976): 245-51. [A]
- Kok, R. A., J. A. Taylor and Walter L. Bradley. "A Statistical Examination of Self-Ordering of Amino Acids in Proteins." *Origins of Life and Evolution of the Biosphere* 18 (1988): 135-42. [A]
- Laudan, Larry. "William Whewell on the Consilience of Inductions." *The Monist* 55 (1971): 368-91. [A]
- Lewin, Roger. "Evolutionary Theory Under Fire." *Science* 210 (1980): 883. [B]
- Liben, Paul. "Science Within the Limits of Truth." *First Things*, December 1991, pp. 29-32. [I]
- Macnab, R. "Bacterial Mobility and Chemotaxis: The Molecular Biology of a Behavioral System." *CRC Critical Reviews in Biochemistry* 5 (1978): 291-341. [A]
- Maher, K., and D. Stevenson. "Impact Frustration of the Origin of Life." *Nature* 331 (1988): 612-14. [A]
- Mandelbaum, M. "Historical Explanation: The Problem of Covering Laws." *History Theory* 1 (1961): 229-42. [A]
- Margulis, L., J. C. Walker and M. Rambler. "Reassessment of Roles of Oxygen and Ultraviolet Light in Precambrian Evolution." *Nature* 264 (1976): 620-24. [A]
- Martin, R. "Singular Causal Explanation." *Theory and Decision* 2 (1972): 221-37. [A]
- Matthews, C. N. "Chemical Evolution: Protons to Proteins." *Proceedings of the Royal Institution* 55 (1982): 199-206. [A]
- Meyer, Stephen C. "Open Debate on Life's Origin." *Insight*, February 21, 1994, pp. 27-29. [B] ..... "A Scopes Trial for the '90s." *The Wall Street Journal*. December 6, 1993, p. A14. [B]
- Miller, S., and J. Bada. "Submarine Hotsprings and the Origin of Life." *Nature* 334 (1988): 609-10. [A]
- Moore, J. N. "Paleontological Evidence and the Organic Evolution." *Journal of the American Scientific Affiliation* special edition, *Origins and Change*, 1978, pp. 49-55. [I]
- Mora, P. T. "Urge and Molecular Biology." *Nature* 199 (1963): 212-19. [A]
- Moreland, J. P. "Scientific Creationism, Science and Conceptual Problems." Forthcoming in *Perspectives on Science and Christian Faith*. [A]
- Murphy, Nancey. "Phillip Johnson on Trial: A Critique of His Critique of Darwin." *Perspectives on Science and Christian Faith* 45, no. 1 (1993): 26-36. [I]

- Padian, Kevin. "Gross Misrepresentation." *Bookwatch Reviews* 2 (1989): 2-3. [B]
- Raup, D. "Conflicts Between Darwin and Paleontology." *Field Museum of Natural History Bulletin* 50, no. 1 (1979): 24-25. [I] ..... "Evolution and the Fossil Record." *Science*, July 17, 1981, p. 289. [I]
- Recker, D. "Causal Efficacy: The Structure of Darwin's Argument Strategy in the *Origin of Species*." *Philosophy of Science* 54 (1987): 147-75. [A]
- Ruse, Michael. "Commentary: The Academic as Expert Witness." *Science, Technology and Human Values* 11, no. 2 (1986): 66-73. [B] ..... "Creation Science Is Not Science." *Science, Technology and Human Values* 7, no. 40 (1982): 72-78. [I] ..... "They're Here!" *Bookwatch Reviews* 2 (1989): 4. [B]
- Saunders, P. T, and M. W. Ho. "Is Neo-Darwinism Falsifiable--and Does It Matter?" *Nature and System* 4 (1982): 179-96. [A]
- Scott, Eugenie, et al. "Why Pandas and People?" *Bookwatch Reviews* 2 (1989): 1. [B]
- Scriven, Michael. "Causation as Explanation." *Nous* 9 (1975): 3-15. [A] ..... "Explanation and Prediction in Evolutionary Theory." *Science* 130 (1959): 477-82. [I] ..... "The Logic of Cause." *Theory and Decision* 2 (1971): 49-66. [A]
- Shapiro, R. "Prebiotic Ribose Synthesis: A Critical Analysis." *Origins of Life and Evolution of the Biosphere* 18 (1988): 71-85. [A]
- Skoog, Gerald. "A View from the Past." *Bookwatch Reviews* 2 (1989): 1-2. [B]
- Smith, J. Maynard. "Hypercycles and the Origin of Life." *Nature* 280 (1979): 445-46. [I]
- Thagard, Paul. "The Best Explanation: Criteria for Theory Choice." *Journal of Philosophy* 75 (1978): 77-92. [A]
- Thomson, K. S. "The Meanings of Evolution." *American Scientist* 70 (1982): 529-31. [I]
- Tipler, F. "How to Construct a Falsifiable Theory in Which the Universe Came into Being Several Thousand Years Ago." *Proceedings of the Biennial Meeting of the Philosophy of Science Association* 2 (1984): 873-902. [A]
- Walton, J. C. "Organization and the Origin of Life." *Origins* 4 (1977): 16-35. [A]
- Yockey, H. P. "A Calculation of the Probability of Spontaneous Biogenesis by Information Theory." *Journal of Theoretical Biology* 67 (1977): 377-98. [A] ..... "Self Organization Origin of Life Scenarios and Information Theory." *Journal of Theoretical Biology* 91 (1981): 13-31. [A]
- Zaug, A. J., and T. R. Cech. "The Intervening Sequence RNA of Tetrahymena Is an Enzyme." *Science* 231 (1986): 470-75. [A]

### ***Conference Presentations and Papers in Books***

Alston, William. "God's Action in the World." In *Evolution and Creation*. Edited by Ernan McMullin. Notre Dame, Ind.: University of Notre Dame Press, 1985. [A]

Courtenay, W. "The Dialectic of Omnipotence in the High and Late Middle Ages." In *Divine Omniscience and Omnipotence in Medieval Philosophy*. Edited by T. Rudovsky. Dordrecht, Netherlands: D. Reidel, 1985. [A]

Dembski, William A. "The Very Possibility of Intelligent Design." Paper presented at Science and Belief, First International Conference of the Pascal Centre, Ancaster, Ontario, August 11-15, 1992. [I]

Doyle, Sir A. C. "The Boscome Valley Mystery." In *The Sign of Three: Peirce, Holmes, Popper*. Edited by T. Sebeok. Bloomington: Indiana University Press, 1983. [B]

Fox, S. W. "Proteinoid Experiments and Evolutionary Theory." In *Beyond Neo-Darwinism*. Edited by M. W. Ho and P. T. Saunders. New York: Academic, 1984. [A]

Gish, Duane. "Creation, Evolution and the Historical Evidence." In *But Is It Science?* Edited by Michael Ruse. Buffalo, N.Y.: Prometheus Books, 1988. [B]

Gould, Stephen Jay. "Evolution as Fact and Theory." In *Science and Creationism*. Edited by Ashley Montagu. New York: Oxford University Press, 1984. [B] ..... . "Genesis and Geology." In *Science and Creationism*. Edited by Ashley Montagu. New York: Oxford University Press, 1984. [I] ..... . "The Senseless Signs of History." In *The Panda's Thumb*. New York: Norton, 1980. [B]

Grinnell, F. "Radical Intersubjectivity: Why Naturalism Is an Assumption Necessary for Doing Science." Paper presented at Darwinism: Scientific Inference or Philosophical Preference? conference, Southern Methodist University, Dallas, March 26-28, 1992. [A] ..... . "Selforganization in Evolution." In *Selforganization*. Edited by S. W. Fox. New York: Adenine, 1986. [A]

Hempel, C. "Explanation in Science and in History." In *Frontiers of Science and Philosophy*. Edited by R. Colodny. Pittsburgh: University of Pittsburgh Press, 1962. [A]

Hull, David. "Darwin and the Nature of Science." In *Evolution from Molecules to Men*. Edited by David Bendall. Cambridge, U.K.: Cambridge University Press, 1985. [A]

Kehoe, A. "Modern Anti-evolutionism: The Scientific Creationists." In *What Darwin Began*. Edited by Laurie R. Godfrey. Boston: Allyn and Bacon, 1985. [B]

Kenyon, D. "A Comparison of Proteinoid and Aldocyanoin Microsystems as Models of the Primordial Cell." In *Molecular Evolution and Protobiology*. Edited by K. Matsuno, K. Dose, K. Harada and D. L. Rohlfs. New York: Plenum, 1984. [A]

Kline, A. David. "Theories, Facts and Gods: Philosophical Aspects of the Creation-Evolution Controversy." In *Did the Devil Make Darwin Do It?* Edited by David B. Wilson. Ames: Iowa State University Press, 1983. [I]

Lakatos, Imre. "Falsification and the Methodology of Scientific Research Programmes." In *Criticism and the Growth of Knowledge*. Edited by Imre Lakatos and Alan Musgrave. Cambridge, U.K.: Cambridge University Press, 1970. [A]

Laudan, Larry. "The Demise of the Demarcation Problem." In *But Is It Science?* Edited by Michael Ruse. Buffalo, N.Y.: Prometheus Books, 1988. [A] ..... . "More on Creationism." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I] ..... . "Science at the Bar--Causes for Concern." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I]

Leslie, John. "Modern Cosmology and the Creation of Life." In *Evolution and Creation*. Edited by Ernan McMullin. Notre Dame, Ind.: University of Notre Dame Press, 1985. [A]

Lewontin, R. Introduction to *Scientists Confront Creationism*. Edited by L. Godfrey. New York: Norton, 1983. [B]

McMullin, Ernan. "Introduction: Evolution and Creation." In *Evolution and Creation*. Edited by Ernan McMullin. Notre Dame, Ind.: University of Notre Dame Press, 1985. [I]

Moorhead, P. S., and M. M. Kaplan. *Mathematical Challenges to the Neo-Darwinian Interpretation of Evolution*. Philadelphia: Wistar Institute Press, 1967. See especially papers and comments from M. Eden, M. Shutzenberger, S. M. Ulam and P. Gavaudan. [A]

Mora, P. T. "The Folly of Probability." In *The Origins of Prebiological Systems and of Their Molecular Matrices*. Edited by S. W. Fox. New York: Academic, 1965. [I]

Overton, William R. "United States District Court Opinion: *McLean v. Arkansas*." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [B]

Pattee, H. H. "The Problem of Biological Hierarchy." In *Towards a Theoretical Biology*, vol. 3. Edited by C. H. Waddington. Edinburgh: Edinburgh University Press, 1970. [A]

Peirce, C. S. "Abduction and Induction." In *The Philosophy of Peirce*. Edited by J. Buchler. London: Routledge, 1956. [I]

Popper, Karl. "Darwinism as a Metaphysical Research Program." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I]

Quinn, Philip L. "Creationism, Methodology and Politics." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [A] ..... . "The Philosopher of Science as Expert Witness." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [B]

Root-Bernstein, Robert. "On Defining a Scientific Theory: Creationism Considered." In *Science and Creationism*. Edited by Ashley Montagu. New York: Oxford University Press, 1984. [I]

Ruse, Michael. "Darwinism: Philosophical Preference, Scientific Inference and Good Research Strategy." Paper presented at Darwinism: Scientific Inference or Philosophical

Preference? conference, Southern Methodist University, Dallas, March 26-28, 1992. [I] ..... . "Karl Popper's Philosophy of Biology." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I] ..... . "Origin of Species." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I] ..... . "A Philosopher's Day in Court." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [B] ..... . "The Relationship Between Science and Religion in Britain, 1830-1870." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I] ..... . "Scientific Creationism." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I] ..... . "Witness Testimony Sheet: *McLean v. Arkansas*." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [B]

Scriven, Michael. "Causes, Connections and Conditions in History." In *Philosophical Analysis and History*. Edited by W. Dray. New York: Harper & Row, 1966. [A] ..... . "New Issues in the Logic of Explanation." In *Philosophy and History*. Edited by S. Hook. New York: New York University Press, 1963. [A] ..... . "Truisms as the Grounds for Historical Explanations." In *Theories of History*. Edited by P. Gardiner. Glencoe, Ill.: Free Press, 1959. [A]

Sedgwick, Adam. "Objections to Mr. Darwin's Theory of the Origin of Species." In *But Is It Science?* Edited by Michael Ruse. Buffalo, New York: Prometheus Books, 1988. [I]

Stent, Gunther S. "Scientific Creationism: Nemesis of Sociobiology." In *Science and Creationism*. Edited by Ashley Montagu. New York: Oxford University Press, 1984. [I]

Valentine, J., and D. Erwin. "Interpreting Great Developmental Experiments: The Fossil Record." In *Development as an Evolutionary Process*. Edited by Rudolf Raff and Elizabeth Raff. New York: Alan R. Liss, 1985. [I]

Webster, Gerry. "The Relations of Natural Forms." In *Beyond Darwinism*. Edited by M. W. Ho and P. T. Saunders. New York: Academic, 1984. [A]

Wicken, J. "Thermodynamics, Evolution and Emergence: Ingredients for a New Synthesis." In *Entropy, Information and Evolution*. Edited by Bruce H. Weber, David J. Depew and James D. Smith. Cambridge, Mass.: MIT Press, 1988. [A]

Wigner, E. "The Probability of the Existence of a Self-Reproducing Unit." In *The Logic of Personal Knowledge: Essays Presented to Michael Polanyi*. Edited by Edward Shils. London: Routledge and Kegan Paul, 1961. [A]

Wiley, B. "Darwin's Place in the History of Thought." In *Darwinism and the Study of Society*. Edited by M. Banton. Chicago: Quadrangle Books, 1961. [I]

Copyright 1994 Stephen C. Meyer. All rights reserved. International copyright secured.  
File Date: 12.29.98

## **The Origin of Life and the Death of Materialism**

**Stephen C. Meyer, Ph.D.**

Reprinted from *The Intercollegiate Review* 31, no. 2 (spring 1996)

## **Introduction**

Alfred North Whitehead once said that "when we consider what religion is for mankind and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them." Whitehead spoke early in this century at a time when most elite intellectuals believed that science contradicted classical theism with its traditional belief in a divine creation, the uniqueness of man and the immortality of the human soul. For many intellectuals a scientifically-informed world view was a materialistic world view in which the mere mention of entities such as God, free will, mind, soul or purpose seemed inherently disreputable. Materialism denied evidence of any intelligent design in nature and any ultimate purpose to human existence. As Whitehead's contemporary Bertrand Russell put it, "man is the product of causes which had no prevision of the end they were achieving" and which predestine him "to extinction in the vast death of the solar system."

It is not hard to see why many intellectuals held this opinion. Despite the now-well documented influence of Christian thinking on the rise of modern science from the time of Ockham to Newton, much of science during the 19th century did take a decidedly materialistic turn. Scientific origins theories in particular seemed to support the materialistic vision of an autonomous and self-creating natural world. For example, at the beginning of the 19th century the French mathematician Laplace offered an ingenious theory known as the nebular hypothesis to account for the origin of the solar system as the outcome of purely natural gravitational forces. In geology, Charles Lyell explained the origin of the earth's most dramatic topographical features, mountain ranges and canyons, as the result of slow, gradual and completely naturalistic processes of change. Most significantly, Darwin's evolutionary theory sought to show that the blind process of natural selection acting on random variations could, and did, account for the origin of new forms of life without any divine intervention or guidance. According to Darwin, living organisms only *appeared* to be designed by an intelligent creator; nature itself was the real creator. Even in cosmology, a belief in the infinity of space and time obviated any need to consider the question of the ultimate origin of matter. Thus, for scientific materialists at the end of the nineteenth century, the whole history of the universe and life could be told as a seamless, or nearly seamless, unfolding of the potentiality of matter and energy. No longer could it be held that a pre-existent mind shaped matter. Rather, modern science showed that matter shaped and created the capacities of mind (and not the reverse). God did not create "the heavens and the earth." The heavens and the earth (i.e., matter) created (via evolution) the minds that created the concept of God.

By the turn of the twentieth century, this once shockingly materialistic approach to science had become the norm. Most twentieth century scientists have assumed no limits to the explanatory power of materialistic forces. Materialistic modes of thought and assumptions have spread from physics and biology to psychology, sociology, criminology, economics, educational theory, and even theology. Thus, Whitehead would in the end attempt to reconcile science and religion by asserting that even God himself evolves.

Yet now at the end of the twentieth century after many wars and genocidal policies pursued in the name of materialistic "science-based" ideologies, the scientific picture of the world is rapidly changing. From the microcosm of the cell and the quantum world, to the macrocosm



of an expanding and finely-tuned universe, the materialistic vision of nature now seems incomplete. Even in biology where Darwin's theory, perhaps more than any other, inspired the possibility of a fully materialistic world view, materialism now seems to be failing as scientists have uncovered an awe-inspiring complexity in even the simplest of living cells. Indeed, nowhere is the inadequacy of materialistic science more evident than in the contemporary discussion of how life in its very "simplest" form might have first originated.

### **The Problem of Life's Origin**

After Darwin published the *Origin of Species* in 1859, many scientists began to think about a problem that Darwin had not addressed, namely, how life had arisen in the first place. While Darwin's theory purported to explain how life could have grown gradually more complex starting from "one or a few simple forms," it did not explain, nor did it attempt to explain, where life had first originated. Indeed, by the 1870s with Darwin's theory of the origin of species, Laplace's nebular hypothesis, and Lyellian geology enjoying widespread support, the origin of life remained as the only salient milestone in cosmic history lacking some materialistic explanation.

Yet, scientists in the 1870s and 1880s assumed that devising an explanation for the origin of life would be fairly easy. For one thing, they assumed that life was essentially a rather simple substance called protoplasm that could be easily constructed by combining and recombining simple chemicals such as carbon dioxide, oxygen and nitrogen. Thus, the German evolutionary biologist Ernst Haeckel would refer to the cell as a simple "homogeneous globule of plasm." To Haeckel a living cell seemed no more complex than a blob of jello. His theory of how life first came into existence reflected this simplistic view. His method likened cell "autogony," as he called it, to the process of inorganic crystallization. Haeckel's English counterpart, T.H. Huxley, proposed a simple two-step method of chemical recombination to explain the origin of the first cell. Just as salt could be produced spontaneously by adding sodium to chloride, so, thought Haeckel and Huxley, could a living cell be produced by adding several chemical constituents together and then allowing spontaneous chemical reactions to produce the simple protoplasmic substance that they assumed to be the essence of life.

### **Orthodox Chemical Evolutionary Theory: The Oparin Scenario**

During the 1920s and 1930s a more sophisticated version of this so-called "chemical evolutionary theory" was proposed by a Russian biochemist named Alexander I. Oparin. Oparin had a much more accurate understanding of the complexity of cellular metabolism, but neither he, nor any one else in the 1930s, fully appreciated the complexity of the molecules such as protein and DNA that make life possible. Oparin, like his nineteenth century predecessors, suggested that life could have first evolved as the result of a series of chemical reactions. Unlike his predecessors, however, he envisioned that this process of chemical evolution would involve many more chemical transformations and reactions and many hundreds of millions (or even billions) of years.

Oparin's theory envisioned a series of chemical reactions (See Figure 1) that he thought would enable a complex cell to assemble itself gradually and naturalistically from simple chemical precursors. Oparin believed that simple gases such as ammonia (NH<sub>3</sub>), methane (CH<sub>4</sub>), water (H<sub>2</sub>O), carbon dioxide (CO<sub>2</sub>) and hydrogen (H<sub>2</sub>) would have rained down to the early oceans and combined with metallic compounds extruded from the core of the earth. With the aid of

ultraviolet radiation from the sun, the ensuing reactions would have produced energy-rich hydrocarbon compounds. These in turn would have combined and recombined with various other compounds to make amino acids, sugars, phosphates and other "building blocks" of the complex molecules (such as proteins) necessary to living cells. These constituents would eventually arrange themselves into simple cell-like enclosures that Oparin called coacervates. Oparin then proposed a kind of Darwinian competition for survival among his coacervates. Those that developed increasingly complex molecules and metabolic processes would have survived and grown more complicated. Those that did not would have dissolved.

Thus, cells would have become gradually more and more complex as they competed for survival over billions of years. Like Darwin, Oparin employed time, chance and natural selection to account for the origin of complexity from initial simplicity. Moreover, nowhere in his scenario did "mind" or "intelligent design" or "a Creator" play any explanatory role. Indeed, for Oparin, a committed Marxist, such notions were explicitly precluded from scientific consideration. Matter interacting chemically with other matter, if given enough time and the right conditions, could produce life. Complex cells could be built from simple chemical precursors without any guiding personal or intelligent agency.

### **The Miller-Urey Experiment**

The first experimental support for Oparin's hypothesis came in December of 1952. While doing graduate work under Harold Urey at the University of Chicago, Stanley Miller conducted the first experimental test of the Oparin chemical evolutionary model. Miller circulated a gaseous mixture of methane ( $\text{CH}_4$ ), ammonia ( $\text{NH}_3$ ), water vapor ( $\text{H}_2\text{O}$ ) and hydrogen ( $\text{H}_2$ ) through a glass vessel containing an electrical discharge chamber. Miller sent a high voltage charge of electricity into the chamber via tungsten filaments in an attempt to simulate the effects of ultraviolet light on prebiotic atmospheric gases. After two days, Miller found a small (2 percent) yield of amino acids in the U-shaped water trap he used to collect reaction products at the bottom of the vessel. While Miller's initial experiment yielded only three of the twenty amino acids that occur naturally in proteins, subsequent experiments performed under similar conditions have produced all but one of the others. Other simulation experiments have produced fatty acids and the nucleotide bases found in DNA and RNA, but not the sugar molecules deoxyribose and ribose necessary to build DNA and RNA molecules.

Miller's success in producing biologically relevant "building blocks" under ostensibly prebiotic conditions was heralded as a great breakthrough. His experiment seemed to provide experimental support for Oparin's chemical evolutionary theory by showing that an important step in Oparin's scenario, the production of biological building blocks from simpler atmospheric gases, was possible on the early earth. Miller's work inspired many similar simulation experiments and an unprecedented optimism about the possibility of developing an adequate naturalistic explanation for the origin of life. Miller's experimental results also received widespread press coverage in popular publications such as *Time* magazine and gave Oparin's model the status of textbook orthodoxy almost overnight. As one writer put it:

"James Watson and Francis Crick unraveled the chemical basis of life . . . Stanley Miller discovered how matter and energy could create the building blocks of life without a preexisting cell. Unleashed from paralysis and spurred by the Space Age, research on the origin of life was launched by these . . . momentous achievements into an era of discovery and achievement."

Indeed, thanks largely to Miller's experimental work, chemical evolution is now routinely presented in both high school and college biology textbooks as the accepted scientific explanation for the origin of life. Yet as we shall see, chemical evolutionary theory is now known to be riddled with difficulties; and Miller's work is understood by the origin-of-life research community itself to have little, if any, relevance to explaining how amino acids, let alone proteins or living cells, actually could have arisen on the early earth.

### **Problems with the Oparin/Miller Hypothesis**

Despite its status as textbook orthodoxy, the Oparin chemical evolutionary theory has in recent years encountered severe, even fatal, criticisms on many fronts. First, geochemists have failed to find evidence of the nitrogen-rich "prebiotic soup" required by Oparin's model. Second, the remains of single-celled organisms in the very oldest rocks testify that, however life emerged, it did so relatively quickly, i.e. fossil evidence suggests that chemical evolution had little time to work before life emerged on the early earth. Third, new geological and geochemical evidence suggests that prebiotic atmospheric conditions were hostile, not friendly, to the production of amino acids and other essential building blocks of life. Fourth, the revolution in the field of molecular biology has revealed so great a complexity and specificity of design in even the "simplest" cells and cellular components as to defy materialistic explanation. Even scientists known for a staunch commitment to materialistic philosophy now concede that materialistic science in no way suffices to explain the origin of life. As Francis Crick has written: "An honest man, armed with all the knowledge available to us now, could only state that in some sense, the origin of life appears at the moment to be almost a miracle, so many are the conditions which would have had to have been satisfied to get it going."

To understand the crisis in chemical evolutionary theory, it will be necessary to explain in more detail the latter two difficulties, namely, the problem of hostile pre-biotic conditions and the problem posed by the complexity of the cell and its components.

When Stanley Miller conducted his experiment simulating the production of amino acids on the early earth, he presupposed that the earth's atmosphere was composed of a mixture of what chemists call reducing gases such as methane ( $\text{CH}_4$ ), ammonia ( $\text{NH}_3$ ) and hydrogen ( $\text{H}_2$ ). He also assumed that the earth's atmosphere contained virtually no free oxygen. Miller derived his assumptions about these conditions from Oparin's 1936 book. In the years following Miller's experiment, however, new geochemical evidence made it clear that the assumptions that Oparin and Miller had made about the early atmosphere could not be justified. Instead, evidence strongly suggested that neutral gases such as carbon dioxide, nitrogen and water vapor, not methane, ammonia and hydrogen, predominated in the early atmosphere. Moreover, a number of geochemical studies showed that significant amounts of free oxygen were also present even before the advent of plant life, probably as the result of volcanic outgassing and the photodissociation of water vapor.

This new information about the probable composition of the early atmosphere has forced a serious re-evaluation of the significance and relevance of Miller-type simulation experiments. As had been well known even before Miller's experiment, amino acids will form readily in an appropriate mixture of reducing gases. In a chemically neutral atmosphere, however, reactions among atmospheric gases will not take place readily and those reactions that do take place will produce extremely low yields of biological building blocks. Further, even a small amount

of atmospheric oxygen will quench the production of biologically significant building blocks and cause any biomolecules otherwise present to degrade rapidly.

An analogy may help to illustrate. Making amino acids in a reducing atmosphere is like getting vinegar and baking soda to react. Because the reaction releases stored chemical energy as heat (i.e. it is "exothermic"), it occurs easily. Trying to make biological building blocks in a neutral atmosphere, however, is more like trying to get oil and water (or any two inert chemicals) to react.

Stanley Miller's experiment, and others like his, are only relevant to the origin of life if the reducing conditions he assumed actually existed on the early earth. Since independent geochemical evidence now strongly suggests that chemically hostile conditions prevailed, Miller's experiment cannot be said to "simulate" anything. Miller's work was heralded as a positive test of Oparin's chemical evolutionary scenario precisely because he had selected parameters for his experiment in accord with a then-current understanding of early atmospheric conditions. What made Miller's experiment significant was not the production of amino acids *per se*, but the production of amino acids from presumably plausible prebiotic conditions. As Miller himself stated, "In this apparatus an attempt was made to duplicate a primitive atmosphere of the earth, and not to obtain the optimum conditions for the formation of amino acids." Now, however, the situation has changed. The only reason to continue assuming the existence of a chemically reducing prebiotic atmosphere is that chemical evolutionary theory seems to require it. As *Science* magazine's Richard Kerr put it, "No geological or geochemical evidence collected in the last 30 years favors a strongly reducing primitive atmosphere. . . Only the success of the laboratory experiments recommends it."

While laboratory simulation experiments have failed to demonstrate the plausibility of chemical evolution, they may have inadvertently demonstrated the necessity of intelligent agency playing an active role in the design of living systems. Ironically, even successful simulation experiments require the intervention of the experimenters to prevent what are known as "interfering cross reactions" and other chemically destructive processes.

Assume for the moment that the reducing gases used by Stanley Miller do actually simulate the conditions on the early earth. Would his experimental results, then, support chemical evolution? Not necessarily. Miller-type simulation experiments have invariably produced non-biological substances in addition to biological building blocks such as amino acids and nucleic acid bases. Without human intervention, these other substances will react readily with biologically relevant building blocks to form a biologically irrelevant compound, a chemically insoluble sludge. To prevent this from happening and to move the simulation of chemical evolution along a biologically promising trajectory, experimenters have often removed those chemicals that degrade or transform amino acids into non-biologically relevant compounds. They must also artificially manipulate the initial conditions in their experiments. Rather than using both short and long-wavelength ultraviolet light which would be present in any realistic atmosphere, they use only short-wavelength UV. Why? The presence of the long-wavelength UV light quickly degrades amino acids. Thus, investigators have routinely manipulated chemical conditions both before and after performing "simulation" experiments in order to protect their experiments from destructive naturally occurring processes. These manipulations constitute what chemist Michael Polanyi called a "profoundly informative intervention."

They seem to simulate, if they simulate anything, the need for an intelligent agent to overcome the randomizing influences of natural chemical processes, processes that lead inexorably, under realistic conditions, to biochemical dead-ends.

### **The Molecular Biological Revolution and the Origin of Information**

Yet a more fundamental problem remains for all chemical evolutionary scenarios. Even if it could be demonstrated that the building blocks of essential molecules could arise in realistic prebiotic conditions, the problem of assembling those building blocks into functioning proteins or DNA chains would remain. This problem of explaining the specific sequencing and thus, the information, within biopolymers, lies at the heart of the current crisis in materialistic evolutionary thinking.

In the early 1950s, the molecular biologist Fred Sanger determined the structure of the protein molecule insulin. Sanger's work made clear for the first time that each protein found in the cell comprises a long and definitely arranged sequence of amino acids. The amino acids in protein molecules are linked together to form a chain, rather like individual railroad cars comprising a long train. Moreover, the function of all such proteins (whether as enzymes or as structural components in the cell) depends upon the specific sequencing of the individual amino acids, just as the meaning of an English text depends upon the sequential arrangement of the letters. The various chemical interactions between amino acids in any given chain will determine the three-dimensional shape or topography that the amino acid chain adopts. This shape in turn determines what function, if any, the amino acid chain can perform within the cell. For a functioning protein, its three-dimensional shape gives it a "hand-in-glove" fit with other molecules in the cell, enabling it to catalyze specific chemical reactions or to build specific structures within the cell. The proteins histone 3 and 4, for example, fold into very well-defined three-dimensional shapes with a precise distribution of positive charges around their exteriors. This shape and charge distribution enables them to form part of the spool-like "nucleosomes" that allow DNA to coil efficiently around itself and to store information. Indeed, the information storage density of DNA, thanks in part to nucleosome spooling, is several trillion times that of our most advanced computer chips.

To get a feel for the specificity of the three dimensional charge distribution on these histone proteins, imagine a large wooden spool with grooves on the surface. Next picture a helical cord made of two strands. Then visualize wrapping the cord around the spool so that it lies exactly into perfectly hollowed out grooves. Finally, imagine the grooves to be hollowed so that they exactly fit the shape of the coiled cord, thicker parts nestling into deeper grooves, thinner parts into more shallow ones. In other words, the irregularities in the shape of the cord exactly match irregularities in the hollow grooves. In the case of histone and DNA, there aren't actually grooves, but there is an uncanny distribution of positively charged regions on the surface of the histone proteins that exactly matches the negatively charged regions of the double stranded DNA that coils around it. Proteins that function as enzymes or that assist in the processing of information stored on DNA strands often have an even greater specificity of fit with the molecules to which they must bind. Almost all proteins function as a result of an extreme "hand-in-glove" three-dimensional specificity that derives from the precise sequencing of the amino acid building blocks.

The discovery of the complexity and specificity of protein molecules has raised serious difficulties for chemical evolutionary theory, even if an abundant supply of amino acids is granted for the sake of argument. Amino acids alone do not make proteins, any more than

letters alone make words, sentences or poetry. In both cases, the sequencing of the constituent parts determines the function (or lack of function) of the whole. In the case of human languages the sequencing of letters and words is obviously performed by intelligent human agents. In the cell, the sequencing of amino acids is directed by the information, the set of biochemical instructions, encoded on the DNA molecule.

### **Information Transfer: From DNA to Protein**

During the 1950s and 60s, at roughly the same time molecular biologists began to determine the structure and function of many proteins, scientists were able to explicate the structure and function of DNA, the molecule of heredity. After James Watson and Francis Crick elucidated the structure of DNA in 1953, molecular biologists soon discovered how DNA directs the process of protein synthesis within the cell. They discovered that the specificity of amino acids in proteins derives from a prior specificity within the DNA molecule, from information on the DNA molecule stored as millions of specifically arranged chemicals called nucleotides or bases along the spine of DNA's helical strands. (See Figure 2) Chemists represent the four nucleotides with the letters A, T, G, and C (for adenine, thymine, guanine and cytosine). As in the case of protein, the sequence specificity of the DNA molecule strongly resembles the sequence specificity of human codes or languages.

Indeed, just as the letters in the alphabet of a written language may convey a particular message depending on their sequence, so too do the sequences of nucleotides or bases in the DNA molecule convey precise biochemical messages that direct protein synthesis within the cell. Whereas the function of the protein molecule derives from the specific arrangement of twenty different amino acids (a twenty-letter alphabet), the function of DNA depends upon the arrangement of just four bases. Thus, it takes a group of three nucleotides (or triplets as they are called) on the DNA molecule to specify the construction of one amino acid. This process proceeds as long chains of nucleotide triplets (the genetic message) are first copied during a process known as DNA replication and then transported (by the molecular messenger m-RNA) to a complex organelle called a ribosome. There at the ribosome site, the genetic message is translated with the aid of an ingenious adaptor molecule called transfer-RNA to produce a growing amino acid chain. (See Figure 3) Thus, the sequence specificity in DNA begets sequence specificity in proteins. Or put differently, the sequence specificity of proteins depends upon a prior specificity, upon information, encoded in DNA.

### **Naturalistic Approaches to the Problem of the Origin Of Information**

The explication of this system by molecular biologists in the 1950s and 1960s, has raised the question of the ultimate origin of the specificity, the information, in both DNA and the proteins it generates. Many scientists now refer to the information problem as the "Holy Grail" of origin-of-life biology. As Bernd-Olaf Koppers recently stated, "the problem of the origin of life is clearly basically equivalent to the problem of the origin of biological information." As mentioned previously, the information contained or expressed in natural languages and computer codes is the product of intelligent minds. Minds routinely create informative arrangements of matter. Yet since the mid-nineteenth century scientists have sought to explain all phenomena by reference to exclusively material causes. Since the 1950s, three broad types of naturalistic explanation have been proposed by scientists to explain the origin of information.



## Biological Information: Beyond the Reach of Chance

After the revolutionary developments within molecular biology in the 1950s and early 1960s made clear that Oparin had underestimated the complexity of life, he revised his initial theory. He sought to account for the sequence specificity of the large protein, DNA and RNA molecules (known collectively as biomacromolecules or biopolymers). In each case, the broad outlines of his theory remained the same, but he invoked the notion of natural selection acting on random variations *within the sequences of the biopolymers* to account for the emergence of their specificity within these molecules. Others invoked the idea of a chance formation for these large information-bearing molecules by speaking of them as "frozen accidents." While many outside origin-of-life biology may still invoke "chance" as a causal explanation for the origin of biological information, few serious researchers still do. Since molecular biologists began to appreciate the sequence specificity of proteins and nucleic acids in the 1950s and 1960s, many calculations have been made to determine the probability of formulating functional proteins and nucleic acids at random.

Various methods of calculating probabilities have been offered by Morowitz, Hoyle, Cairns-Smith, Prigogine, Yockey and more recently, Robert Sauer. For the sake of argument, these calculations have generally assumed extremely favorable prebiotic conditions (whether realistic or not) and theoretically maximal reaction rates among the constituent monomers (i.e. the constituent parts of the proteins, DNA and RNA). Such calculations have invariably shown that the probability of obtaining functionally sequenced biomacromolecules at random is, in Prigogine's words, "vanishingly small . . . even on the scale of . . . billions of years." As Cairns-Smith wrote in 1971: "Blind chance...is very limited. Low-levels of cooperation he [blind chance] can produce exceedingly easily (the equivalent of letters and small words), but he becomes very quickly incompetent as the amount of organization increases. Very soon indeed long waiting periods and massive material resources become irrelevant." Consider the probabilistic hurdles that must be overcome to construct even one short protein molecule of about one hundred amino acids in length. (A typical protein consists of about 300 amino acids, and some are very much longer).

First, all amino acids must form a chemical bond known as a peptide bond so as to join with other amino acids in the protein chain. Yet in nature many other types of chemical bonds are possible between amino acids; in fact, peptide and non-peptide bonds occur with roughly equal probability. Thus, at any given site along a growing amino acid chain the probability of having a peptide bond is roughly 1/2. The probability of attaining four peptide bonds is:  $(1/2 \times 1/2 \times 1/2 \times 1/2) = 1/16$  or  $(1/2)^4$ . The probability of building a chain of 100 amino acids in which all linkages involve peptide linkages is  $(1/2)^{100}$  or roughly 1 chance in  $10^{30}$ . Second, in nature every amino acid has a distinct mirror image of itself, one left-handed version or L-form and one right-handed version or D-form. These mirror-image forms are called optical isomers. Functioning proteins tolerate only left-handed amino acids, yet the right-handed and left-handed isomers occurs in nature with roughly equal frequency. Taking this into consideration compounds the improbability of attaining a biologically functioning protein. The probability of attaining at random only L-amino acids in a hypothetical peptide chain 100 amino acids long is again  $(1/2)^{100}$  or roughly 1 chance in  $10^{30}$ . The probability of building a 100 amino acid length chain at random in which all bonds are peptide bonds and all amino acids are L-form would be  $(1/4)^{100}$  or roughly 1 chance in  $10^{60}$  (zero for all practical purposes given the time available on the early earth). Functioning proteins have a third independent requirement, the most important of all; their amino acids must link up in a specific sequential

arrangement just the letters in a meaningful sentence must. In some cases, even changing one amino acid at a given site can result in a loss of protein function.

Moreover, because there are twenty biologically occurring amino acids the probability of getting a specific amino acid at a given site is small, i.e.  $1/20$ . (Actually the probability is even lower because there are many non-proteinogenic amino acids in nature). On the assumption that all sites in a protein chain require one particular amino acid, the probability the probability of attaining a particular protein 100 amino acids long would be  $(1/20)^{100}$  or roughly 1 chance in  $10^{130}$ . We know now, however, that some sites along the chain do tolerate several of the twenty proteinogenic amino acids, while others do not. The biochemist Robert Sauer of M.I.T has used a technique known as "cassette mutagenesis" to determine just how much variance among amino acids can be tolerated at any given site in several proteins. His results have shown that, even taking the possibility of variance into account, the probability of achieving a functional sequence of amino acids in several functioning proteins at random is still "vanishingly small," roughly 1 chance in  $10^{65}$  an astronomically large number. (There are  $10^{65}$  atoms in our galaxy).

In light of these results, biochemist Michael Behe has compared the odds of attaining proper sequencing in a 100 amino acid length protein to the odds of a blindfolded man finding a single marked grain of sand hidden in the Sahara Desert, not once, but three times. Moreover, if one also factors in the probability of attaining proper bonding and optical isomers, the probability of constructing a rather short functional protein at random becomes so small as to be effectively zero (1 chance in 10 even given our multi-billion year old universe). All these calculations, thus simply reinforce the opinion that has prevailed since the mid-1960s within origin of life biology: chance is not an adequate explanation for the origin of biological specificity. What Mora said in 1963 still holds: "Statistical considerations, probability, complexity, etc., followed to their logical implications suggest that the origin and continuance of life is not controlled by such principles. An admission of this is the use of a period of practically infinite time to obtain the derived result. Using such logic, however, we can prove anything."

### **Pre-Biotic Natural Selection: A Contradiction in Terms**

At nearly the same time that many researchers became disenchanted with "chance" explanations, theories of pre-biotic natural selection also fell out of favor. Such theories allegedly overcome the difficulties attendant pure chance theories by providing a mechanism by which complexity-increasing events in the cell would be preserved and selected. Yet these theories share many of the difficulties that afflict purely chance-based theories. Oparin's revised theory, for example, claimed that a kind of natural selection acted upon random polymers as they formed and changed within his coacervate protocells.

As more complex molecules accumulated, they presumably survived and reproduced more prolifically. Nevertheless, to many, Oparin's discussion of differential reproduction seemed to presuppose a pre-existing mechanism of self-replication. Self-replication in all extant cells depends upon functional (and, therefore, to a high degree sequence-specific) proteins and nucleic acids. Yet the origin of these molecules is precisely what Oparin needed to explain. Thus, many rejected the postulation of prebiotic natural selection as question begging. Functioning nucleic acids and proteins (or molecules approaching their complexity) seemed necessary to self-replication, which in turn seemed necessary to natural selection. Yet Oparin invoked natural selection to explain the origin of proteins and nucleic acids. As the



evolutionary biologist Dobzhansky would proclaim, "prebiological natural selection is a contradiction in terms." Or as Pattee put it: ". . . there is no evidence that hereditary evolution occurs except in cells which already have the complete complement of hierarchical constraints, the DNA, the replicating and translating enzymes, and all the control systems and structures necessary to reproduce themselves." In any case, as just discussed, functional sequences of amino acids, i.e. proteins, cannot be counted on to arise via random events, even if some means of selecting them exists after they have been produced. Natural selection can only select what chance has first produced and chance, at least in a prebiotic setting, seems an implausible agent for producing the information present in even a single functioning protein or DNA molecule.

Oparin attempted to circumvent this problem by claiming that the first polymers need not have been terribly specific. But this claim raises doubts about whether self-replication (and thus, natural selection) could have proceeded at all. The mathematician Von Neumann, for example, showed that any system capable of self-replication would need to contain sub-systems that were functionally equivalent to the information storage, replicating and processing systems found in extant cells. His calculations and similar ones by Wigner, Landsberg, and Morowitz, showed that random fluctuations of molecules in all probability would not produce the minimal complexity needed for even a primitive replication system. Indeed, the improbability of developing a replication system vastly exceeds the improbability of developing the protein or DNA components of such system. As P.T. Mora put it: "To invoke statistical concepts, probability and complexity to account for the origin and the continuance of life is not felicitous or sufficient. As the complexity of a molecular aggregate increases, and indeed very complex arrangements and interrelationships of molecules are necessary for the simplest living unit, the probability of its existence under the disruptive and random influence of physico-chemical forces decreases; the probability that it will continue to function in a certain way, for example, to absorb and to repair, will be even lower; and *the probability that it will reproduce*, [is] still lower. For this reason most scientists now dismiss appeals to prebiotic natural selection as essentially indistinguishable from appeals to chance.

### **Self-Organizational Scenarios**

Because of these difficulties, many origin-of-life theorists after the mid-1960s attempted to address the problem of the origin of biological information in a completely new way. Rather than invoking pre-biotic natural selection or "frozen accidents," many theorists suggested that the laws of nature and chemical attraction may themselves be responsible for the information in DNA and proteins. Some have suggested that simple chemicals might possess "self-ordering properties" capable of organizing the constituent parts of proteins, DNA and RNA into the specific arrangements they now possess. Steinman and Cole, for example, suggested that differential bonding affinities or forces of chemical attraction between certain amino acids might account for the origin of the sequence specificity of proteins. Just as electrostatic forces draw sodium ion ( $\text{Na}^+$ ) and chloride ions ( $\text{Cl}^-$ ) together into a highly-ordered patterns within a crystal of salt ( $\text{NaCl}$ ), so too might amino acids with special affinities for each other arrange themselves to form proteins. This idea was developed in a book called *Biochemical Predestination* by Kenyon and Steinman in 1969. They argued that the origin of life might have been "biochemically predestined" by the properties of attraction that exist between constituent chemical parts, particularly between amino acids in proteins. In 1977, another self-organizational theory was proposed by Prigogine and Nicolis based on a thermodynamic characterization of living organisms. In their book *Self Organization in Nonequilibrium Systems*, Prigogine and Nicolis classified living organisms as open, nonequilibrium systems

capable of "dissipating" large quantities of energy and matter into the environment. They observed that open systems driven far from equilibrium often display self-ordering tendencies. For example, gravitational energy will produce highly ordered vortices in a draining bathtub; thermal energy flowing through a heat sink will generate distinctive convection currents or "spiral wave activity." Prigogine and Nicolis then argued that the organized structures observed in living systems might have similarly "self-originated" with the aid of an energy source. In essence, they conceded the improbability of simple building blocks arranging themselves into highly ordered structures under normal equilibrium conditions. But they suggested that, under non-equilibrium conditions, where an external source of energy is supplied, biochemical building blocks might arrange themselves into highly ordered patterns.

## **Order v. Information**

For many current origin-of-life scientists self-organizational models now seem to offer the most promising approach to explaining the origin of biological information. Nevertheless, critics have called into question both the plausibility and the relevance of self-organizational models. Ironically, perhaps the most prominent early advocate of self-organization, Professor Dean Kenyon, has now explicitly repudiated such theories as both incompatible with empirical findings and theoretically incoherent. First, empirical studies have shown that some differential affinities do exist between various amino acids (i.e., particular amino acids do form linkages more readily with some amino acids than others). Nevertheless, these differences do not correlate to actual sequencing in large classes of known proteins. In short, differing chemical affinities do not explain the multiplicity of amino acid sequences that exist in naturally occurring proteins or the sequential ordering of any single protein.

In the case of DNA this point can be made more dramatically. Figure 4 shows the structure of DNA depends upon several chemical bonds. There are bonds, for example, between the sugar and the phosphate molecules that form the two twisting backbones of the DNA molecule. There are bonds fixing individual nucleotide bases to the sugar-phosphate backbones on each side of the molecule. There are also hydrogen bonds stretching horizontally across the molecule between nucleotide bases making so-called complementary pairs. These bonds, which hold two complementary copies of the DNA message text together, make replication of the genetic instructions possible. Most importantly, however, notice that there are *no* chemical bonds between the nucleotide bases that run along the spine of the helix. Yet it is precisely along this axis of the molecule that the genetic instructions in DNA are encoded. In other words, the chemical constituents that are responsible for the message text in DNA do not interact chemically in any significant way. Just as the letters in a Scrabble game can be combined and recombined in any way to form various sequences, so too can each of the four nucleotide bases attach to any site on the DNA backbone with equal facility, making all sequences equally probable (or improbable). Thus, "self-organizing" bonding affinities can not explain the sequential ordering of the nucleotide bases along the spine of the DNA because *there are no chemical bonds* between the nucleotides that make the message text. Because the same holds for RNA molecules, researchers who speculate that life began in an "RNA world," have also failed to solve the sequencing problem, i.e., the problem of explaining how information present in all functioning RNA molecules could have arisen in the first place. For those who want to explain the origin of life as the result of self-organizing properties intrinsic to the material constituents of living systems, these rather elementary facts of molecular biology have devastating implications. The most logical place to look for self-organizing properties to explain the origin of genetic information is in the constituent parts of

the molecules carrying that information. But biochemistry and molecular biology make clear that forces of attraction between the constituents in DNA, RNA and proteins do not explain the sequence specificity of these large information-bearing biomolecules.

Significantly, information theorists insist that there is a good reason for this. If chemical affinities between the constituents in the DNA message text determined the arrangement of the text, such affinities would dramatically diminish the capacity of DNA to carry information. To illustrate, imagine receiving the following incomplete message over the wire. The "q-ick brown fox jumped over the lazy dog." Obviously someone who knew the conventions of English could determine which letter had been rubbed out in the transmission? Because "q" and "u" always go together by grammatical necessity, the presence of one indicates the probable presence of the other in the initial transmission of the message. The "u" in all English communications is an example of what information theorists call "redundancy." Given the grammatical rule "'u' must always follow 'q'", the addition of the "u" adds no new information, when "q" is already present. It is "redundant" or unnecessary to determining the sense of the message (though not to making it grammatically correct). Now consider what would happen if the individual nucleotide "letters" (A, T, G, C) in a DNA molecule *did* interact by *chemical* necessity with each other. Every time adenine (A) occurred in a growing genetic sequence, it would likely drag thymine (T) along with it. Every time cytosine (C) found a slot, guanine would follow. As a result, the DNA message text would be peppered with repeating sequences of A's followed by T's and C's followed by G's. Rather than having a genetic molecule capable of unlimited novelty with all the unpredictable and aperiodic sequences that characterize informative texts, we would have a highly repetitive text awash in redundant sequences, much as happens in crystals. Indeed, in a crystal the forces of mutual chemical attraction do completely explain the sequential ordering of the constituent parts and consequently crystals cannot convey novel information. Sequencing in crystals is highly ordered or repetitive, but not informative. Once one has seen "Na" followed by "Cl" in a crystal of salt, for example, one has seen the extent of the sequencing possible. In DNA, however, where any nucleotide can follow any other, innumerable novel sequences are possible, and a countless variety of amino acid sequences can be built. The forces of chemical necessity, like grammatical necessity in our "q-and-u" example above, produce redundancy or monotonous order, but reduce the capacity to convey information and create novelty.

As chemist Michael Polanyi has said: "Suppose that the actual structure of a DNA molecule were due to the fact that the bindings of its bases were much stronger than the bindings would be for any other distribution of bases, then such a DNA molecule would have no information content. Its code-like character would be effaced by an overwhelming redundancy. . . . Whatever may be the origin of a DNA configuration, it can function as a code only if its order is not due to the forces of potential energy. It *must be* as physically indeterminate as the sequence of words is on a printed page." (emphasis added)

So, if chemists had found that bonding affinities between the nucleotides in DNA produced nucleotide sequencing, they would have also found that they had been mistaken about DNA's information-bearing properties. To put the point quantitatively, to the extent that forces of attraction between constituents in a sequence determine the arrangement of the sequence, to that extent, will the information carrying capacity of the system be diminished. Bonding affinities, to the extent they exist, mitigate against the maximization of information. They can not, therefore, be used to explain the origin of information. Affinities create mantras, not messages. The tendency to conflate the qualitative distinction between "order" and "information" has characterized self-organizational research efforts and calls into question the

relevance of such work to the origin of life. As Yockey has argued, the accumulation of structural or chemical order does not explain the origin of biological complexity (i.e., genetic information). He concedes that energy flowing through a system may produce highly ordered patterns. Strong winds form swirling tornados and the "eyes" of hurricanes; Prigogine's thermal baths do develop interesting "convection currents"; and chemical elements do coalesce to form crystals. Self-organizational theorists explain well what doesn't need explaining. What needs explaining is not the origin of order (in the sense of symmetry or repetition), but the origin of information, the highly improbable, aperiodic, and yet specified sequences that make biological function possible. To illustrate the distinction between order and information compare the sequence "ABABABABABABAB" to the sequence "Help! Our neighbor's house is on fire!" The first sequence is repetitive and ordered, but not complex or informative. The second sequence is not ordered, in the sense of being repetitious, but it is complex and also informative. The second sequence is complex because its characters do not follow a rigidly repeating or predictable pattern, i.e, it is aperiodic. It is also informative because, unlike a *merely* complex sequence such as "rfsxdcnct<e%dwqj", the particular arrangement of characters is highly exact or "specified" so as to perform a (communication) function. Systems that are characterized by both specificity and complexity (what information theorists call "specified complexity") have "information content."

Since such systems have the qualitative feature of complexity (aperiodicity), they are qualitatively distinguishable from systems characterized by simple periodic order. Thus, attempts to explain the origin of order have no relevance to discussions of the origin of specified complexity or information content. Significantly, the nucleotide sequences in the coding regions of DNA have, by all accounts, a high information content, that is, they are both highly specified and complex, just like meaningful English sentences. Conflating order and information (or specified complexity) has led many to attribute properties to brute matter that it does not possess. While energy in a system *can* create patterns of symmetric order such as whirling vortices, there is no evidence that energy alone can encode functionally specified sequences, whether biochemical or otherwise.

As Yockey warns: "Attempts to relate the idea of order . . . with biological organization or specificity must be regarded as a play on words which cannot stand careful scrutiny. Informational macromolecules can code genetic messages and therefore can carry information because the sequence of bases or residues is affected very little, if at all, by [self-organizing] physico-chemical factors."

### **The Return of the Intelligent Design Hypothesis**

The preceding discussion suggests that the properties of the material constituents of DNA, like those of any information-bearing medium, are not responsible for the information conveyed by the molecule. Indeed, in all informational systems, the information content or message is neither deducible from the properties of the material medium nor attributable to them. The properties of matter do not explain the origin of the information.

To amplify this point consider, first, that many different materials can express the same message. The headline of this morning's *New York Times* was written with ink on paper. Nevertheless, many other materials could have been used to convey the same message. The information in the headline could have been written with chalk on a board, with neon-filled tubes in a series of signs, or by a sky-writer over New York harbor. Clearly, the peculiar chemical properties of ink are not necessary to convey the message. Neither are the physical

properties (i.e., the geometric shapes) of the letters necessary to transmit the information. The same message could have been expressed in Hebrew or Greek using entirely different alphabetic characters. Conversely, the same material medium (and alphabetic characters) can express many different messages, i.e. the medium is not sufficient to determine the message. This November the *Times* will use ink and English characters to tell the reading public that either a Democrat, a Republican or a third-party candidate has won the Presidential election. Yet the properties of the ink and the 26 letters available to the type-setter will not determine which headline will be broadcast by the *Times*. Instead, the ink and English characters will permit the transmission of whatever headline the election requires, as well as a vast ensemble of other possible arrangements of text, some meaningful, and many more not. Neither the chemistry of the ink nor the shapes of the letters determine the meaning of the text. In short, the message transcends the properties of the medium.

The information in DNA also transcends the properties of its material medium. Because chemical bonds do not determine the arrangement of nucleotide bases, the nucleotides can assume a vast array of possible sequences and thereby express many different messages. (Conversely, various materials can express the same messages, as happens in variant versions of the genetic code or when laboratory chemists use English instructions to direct the synthesis of naturally occurring proteins). Thus, again, the properties of the constituents do not determine the function, the information transmitted, by the whole. As Michael Polanyi has said: "As the arrangement of a printed page is extraneous to the chemistry of the printed page, so is the base sequence in a DNA molecule extraneous to the chemical forces at work in the DNA molecule."

If the properties of matter (i.e., the medium) do not suffice to explain the origin of information, what does? Blind chance is, of course, a possibility but *not*, as we have seen in the case of DNA and proteins, where the amount of information (or the improbability of arrangement) gets too immense. The random selection and sequencing of Scrabble pieces out of a grab bag might occasionally produce a few meaningful words such as "cat" or "ran." Nevertheless, undirected selection will inevitably fail as the numbers of letters required to make a text increases. Fairly soon, chance becomes clearly inadequate as origin-of-life biologists have almost universally acknowledged.

Some have suggested that the discovery of some new scientific laws might explain the origin of biological information. But this suggestion betrays confusion on two counts. First, scientific laws don't generally explain or cause natural phenomena, they describe them. For example, Newton's law of gravitation described, but did not explain, the attraction between planetary bodies. Second, scientific laws describe (almost by definition) highly regular phenomena, i.e., order. Thus, to say that any scientific law can describe, or generate, an informational sequence, is essentially a contradiction in terms. The patterns that laws describe are necessarily highly ordered, not complex. Thus, like crystals, all law-like patterns have an extremely limited capacity to convey information. One might, perhaps, find a complex set of material conditions capable of generating high information content on a regular basis, but everything we know suggests that the complexity and information content of such conditions would have to equal or exceed that of any system produced, thus again begging the question about the ultimate origin of information. For example, the chemist J. C. Walton has argued (echoing earlier articles by Mora) that even the self-organization produced in Prigogine-style convection currents does not exceed the organization or information represented by the experimental apparatus used to create the currents.

Similarly, Maynard-Smith and Dyson have shown that Manfred Eigen's so-called hypercycle model for generating information naturalistically is subject to the same law of information loss. They show, first, that Eigen's hypercycles presuppose a large initial contribution of information in the form of a long RNA molecule and some forty specific proteins. More significantly, they show that because hypercycles lack an error-free mechanism of self-replication, they become susceptible to various "error-catastrophes" that ultimately diminish, not increase, the information content of the system over time. Instead, our experience with information-intensive systems (especially codes and languages) indicates that such systems always come from an intelligent source, i.e., from mental or personal agents. This generalization holds not only for the information present in languages and codes but also for the non-grammatical information (also describable as specified complexity) inherent in machines or expressed in works of art. Like the text of a newspaper, the parts of a supercomputer and the faces on Mount Rushmore require many instructions to specify their shape or arrangement and consequently, have a high information content. Each of these systems are also, not coincidentally, the result of intelligent design, not chance or material forces.

Our generalization about the cause of information has, ironically, received confirmation from origin-of-life research itself. During the last forty years, every naturalistic model proposed has failed to explain the origin of information. Thus, mind or intelligence or what philosophers call "agent causation," now stands as the only known cause known to be capable of creating an information-rich system, including the coding regions of DNA, functional proteins and the cell as a whole. Because mind or intelligent design is a necessary cause of an informative system, one can detect (or, logically, retrodict) the past action of an intelligent cause from the presence of an information-intensive effect, even if the cause itself cannot be directly observed. Since information requires an intelligent source, the flowers spelling "Welcome to Victoria" in the gardens of Victoria harbor, lead visitors to infer the activity of intelligent agents even if they did not see the flowers planted and arranged. Similarly, the specifically arranged nucleotide sequences, the encoded information, in DNA imply the past action of an intelligent mind, even if such mental agency cannot be directly observed.

Moreover, the logical calculus underlying such inferences follows a valid and well-established method used in all historical and forensic sciences. In historical sciences, knowledge of the present causal powers of various entities and processes enables scientists to make inferences about possible causes in the past. When a thorough study of various possible causes turns up just a single adequate cause for a given effect, historical or forensic scientists can make fairly definitive inferences about the past. Several years ago, for example, one of the forensic pathologists from the original Warren Commission that investigated the assassination of President Kennedy spoke out to quash rumors about a second gunman firing from in front of the motorcade. Apparently, the bullet hole in the back of President Kennedy's skull evidenced a distinctive beveling pattern that clearly indicated its direction of entry. In this case, it revealed definitely that the bullet had entered from the rear. The pathologist called the beveling pattern a "distinctive diagnostic" to indicate a necessary causal relationship between the direction of entry and the presence of the beveling. Inferences based on knowledge of necessary causes ("distinctive diagnostics") are quite common in historical and forensic sciences, and often lead to the detection of intelligent, as well as, natural causes. Since Criminal X's fingers are the only known cause of Criminal X's fingerprints, X's prints on the murder weapon incriminate him with a high degree of certainty. In the same way, since intelligent design is the only known cause of information-rich systems, the presence of information, including the information-rich nucleotide sequences in DNA, implies an



intelligent source. Scientists in many fields recognize the connection between intelligence and information and make inferences accordingly. Archaeologists assume a mind produced the inscriptions on the Rosetta Stone. Evolutionary anthropologists try to demonstrate the intelligence of early hominids by arguing that certain chipped flints are too improbably specified to have been produced by natural causes. N.A.S.A.'s search for extra-terrestrial intelligence (S.E.T.I.) presupposed that information imbedded in electromagnetic signals from space would indicate an intelligent source. As yet, however, radio-astronomers have not found information-bearing signals coming from space. But closer to home, molecular biologists have identified encoded information in the cell. Consequently, a growing number of scientists now suggest that the information in DNA justifies making what probability theorist William Dembski and biochemist Michael Behe call "the design inference."

## **Conclusion**

During the last forty years, molecular biology has revealed a complexity and intricacy of design that exceeds anything that was imaginable during the late-nineteenth century. We now know that organisms display any number of distinctive features of intelligently engineered high-tech systems: information storage and transfer capability; functioning codes; sorting and delivery systems; regulatory and feed-back loops; signal transduction circuitry; and everywhere, complex, mutually-interdependent networks of parts. Indeed, the complexity of the biomacromolecules discussed in this essay does not begin to exhaust the full complexity of living systems. As even the staunch materialist Richard Dawkins has allowed, "Biology is the study of complicated things that give the appearance of having been designed for a purpose." Yet the materialistic science we have inherited from the late-nineteenth century, with its exclusive conceptual reliance on matter and energy, could neither envision nor can it now account for the biology of the information age. As Werner Gitt has said, throughout the natural sciences "energy and matter are considered to be basic, universal quantities. But the concept of information has become just as fundamental and far reaching. . . information has rightly become known as the third fundamental quantity." Or as Norbert Wiener put it, "Information is information, neither energy nor matter. No materialism that fails to take account of this can survive the present day." The molecular biology of the cell raises the possibility that "no materialism" will survive the revolution beginning to take root in science. While established journals and institutions continue to propagate the orthodoxies of a generation ago, many scientists, philosophers of science and mathematicians have begun to challenge these views and to formulate alternative approaches. Recent work in probability theory has defined information more precisely and articulated clear mathematical criteria for the identification of intelligently designed systems, thus providing a theoretical framework for a new science based upon the reality of design. A new book on the "irreducible complexity" of biochemical systems explains why gradual undirected evolution cannot produce such systems, and suggests intelligent design as the most viable scientific alternative. A new peer-reviewed journal, *Origins & Design*, opens this spring with a seminal article by a former chemical evolutionist turned design-advocate. Other work promises to reshape our conception, not only of living things but of our science and ourselves. If the simplest life owes its origin to an intelligent Creator, then perhaps man is not the "cosmic orphan" that twentieth century scientific materialism has taught. Perhaps then, during the twenty first century, the traditional moral and spiritual foundations of the West will find support from the very sciences that once seemed to undermine them.

## Acknowledgements

For helpful comments and criticisms I would like to thank: Ed Olson, Priscilla DeWolf, Dean Kenyon, Jonathan Wells and Paul Nelson. For generous research support, I would like to thank The Pascal Centre, John and Georgia Wiester and C. Davis Weyerhaeuser.

## Biographical Information

Stephen C. Meyer is a Senior Fellow at the Discovery Institute in Seattle and an Associate Professor of Philosophy at Whitworth College in Spokane, Washington. He received an Ph.D. in the history and philosophy of science from the University of Cambridge in 1991 where he wrote his doctoral thesis about origin-of-life biology. He also holds degrees in physics and geology and has worked as a geophysicist for the Atlantic Richfield Company. In addition to technical articles in the philosophy of science, he has written for newspapers and magazines such as *The Wall Street Journal*, *The Los Angeles Times*, *The Chicago Tribune*, *Insight* and *National Review*. He is currently co-authoring one book (Signs of Mind: Detecting Design in Biological Systems) and editing another (Detecting Design in Creation) on the evidence for intelligent design in biology.

## Bibliography

- Alberts, B., Bray, D. et al. (1983). *Molecular Biology of the Cell*. New York: Garland.
- Ambrose, E.J. (1982) *The nature and Origin of the Biological World*. New York: Halstead Press.
- Araujo, L. (1981). Interview with A.I. Oparin in Mexico City newspaper Uno Mas Uno, May 7, 1981.
- Augros, R. and Stanciu, G. (1987) *The New Biology*. Boston: Shambala.
- Ayuob, G. (1996) "On the design of the vertebrate retina". *Origins & Design* 17(1): 19-22.
- Behe, M., (1993) "Molecular machines: experimental support for the design inference". Presented to ASA Intelligent Design Symposium, August 9th, 1993, unpublished.
- Behe, M. (1994) "Experimental support for regarding functional classes of proteins to be highly isolated from each other". In: *Darwinism: Science or Philosophy*, Buell, J. and Hearn G. pp. 60-71.
- Behe, M. (1996) *Darwin's Black Box*. New York: The Free Press.
- Berkner, L.C. and Marshall, L.L. (1965). "On the origin and rise of oxygen concentration in the earth's atmosphere". *Journal of Atmospheric Science* 22: 225-61.
- Bertalanffy, L. V. (1967). *Robots, Men and Minds*. New York: George Braziller.
- Borek, E. (1969). *The Code of Life*. New York.
- Bradley, W. (1988) "Thermodynamics and the origin of life". *Perspectives on Science and Christian Faith* 40 (2) 72-83.



Brinkman, R.T. (1969). "Dissociation of water vapor and evolution of oxygen in the terrestrial atmosphere". *Journal of Geophysical Research* 74: 5354-68.

Brooks, J. and Shaw G. (1973). *Origin and Development of Living Systems*. New York: Academic Press.

Brooks, J. (1985) *Origins of Life*. Sidney: Lion.

Bowie, J. and Sauer, R. (1989) "Identifying determinants of folding and activity for a protein of unknown structure". *Proceedings of the National Academy of Sciences USA* 86: 2152-2156.

Bowie, J., Reidhaar-Olson, J., Lim, W. and Sauer, R. (1990) "Deciphering the message in protein sequences: tolerance to amino acid substitution". *Science* 247: 1306-1310.

Cairns-Smith, A.G. (1971). *The Life Puzzle*. Edinburgh: Oliver and Boyd.

Carver, J.H. (1981). "Prebiotic atmospheric oxygen levels". *Nature* 292: 136-38.

Cech (1989) "Ribozyme self-replication?". *Nature* 339: 507-08.

Conant, J.B. (1953) *Modern Science and Modern Man*. Garden City, New York: Doubleday Anchor Books.

Crick, F. (1968) "The origin of the genetic code". *Journal of Molecular Biology* 38: 367-79.

Crick, F. (1981) *Life Itself*. New York: Simon and Schuster.

Dawkins, R. (1986) *The Blind Watchmaker*. London: Longman.

Darwin, C. (1859) *The Origin of Species by Means of Natural Selection*. Harmondsworth, England: Penguin. 1984 Reprint.

Darwin, C. (1871) *Letter to Hooker*. Courtesy of Mr. Peter Gautrey. Cambridge University Library, Darwin Archives, Manuscripts Room.

Day, W. (1984). *Genesis on Planet Earth*. New Haven.

De Duve (1995) *Vital Dust: Life as a Cosmic Imperative*. New York: Basic Books.

De Duve (1996) "The constraints of chance". *Scientific American*, January, p. 112.

Dembski, W.A. (1996) *The Design Inference: Eliminating Chance Through Small Probabilities*. University of Illinois, Ph.D. Thesis.

Denton, M. (1986) *Evolution: A Theory in Crisis*. London: Adler and Adler.

Dickerson, R.E. (1978) "Chemical evolution and the origin of life". *Scientific American* 239: 70-85.

- Dimroth, E. and Kimberly, M.M., (1976). "Pre-Cambrian atmospheric oxygen: evidence in sedimentary distribution of carbon, sulfur, uranium and iron". *Canadian Journal Of Earth Sciences* 13: 1161-85.
- Dobzhansky, T. (1965). "Discussion of G. Schramm's Paper." In: S.W. Fox (ed.) *The Origins of Prebiological Systems and of their Molecular Matrices*, pp.309-15. New York: Academic Press.
- Dose, K. (1988) "The origin of life: more questions than answers". *Interdiscipl. Sci. Rev.* 13: 348-356.
- Dyson, F. (1985). *Origins of Life*. Cambridge: Cambridge University Press.
- Eigen, M., Gardner, W., and Schuster, P., and Winkler-Oswaititich, R. (1981) "The origin of genetic information". *Scientific American* 244: 88-118.
- Edwards, A.W.F. (1986) "Are Mendel's results really too close?" *Biological Reviews* 61: 295-312.
- Ferris, J.P., (1987) "Prebiotic synthesis: problems and challenges", *Cold Spring Harbor Symposia on Quantitative Biology* 52: 30ff.
- Gillespie, N.C. (1979) *Charles Darwin and the Problem with Creation*. Chicago: University of Chicago Press.
- Gitt, W. (1989) "Information: the Third Fundamental Quantity". *Siemens Review* 56 (6) 2-7.
- Graham, L. (1973). *Science and philosophy in the Soviet Union*. London.
- Haeckel, E. (1866). *Generelle Morphologie der Organismen*. vol. 1. Berlin.
- Haeckel, E. (1892). *The History of Creation*. Translated by E.R. Lankester. London.
- Haeckel, E. (1905). *The Wonders of Life*. Translated by J.McCabe. London.
- Harada, K. and Fox, S. (1964). "Thermal synthesis of amino acids from a postulated primitive terrestrial atmosphere". *Nature* 201: 335-37.
- Hilts, Philip J. (1992) "Plagiarists Take Note: Machine is on Guard". *The New York Times*, January 7, section C [Science Times], pp. 9.
- Holland, H.D., Lazar, B. and McCaffrey M. (1986). "Evolution of the atmosphere and oceans". *Nature* 320: 27-33.
- Horgan, J. (1996) "The world according to RNA". *Scientific American*, January, p. 27.
- Hoyle, F. and Wickramasinghe, S. (1981) *Evolution from Space*. London: J.M. Dent.
- Huxley, T.H. (1869) "On the physical basis of life". *The Fortnightly Review* 5: 129-45.

- Johnson, P. (1991) *Darwin on Trial*. Washington, D.C: Regnery Gateway.
- Judson, H. (1979) *The Eighth Day of Creation*. New York: Simon and Schuster.
- Kamminga, H. (1980). *Studies in the History of Ideas on the Origin of Life*. Ph.D. thesis, University of London.
- Kasting, J.F., Liu, S.C. and Donahue, T.M. (1979). "Oxygen levels in the prebiological atmosphere". *Journal of Geophysical Research* 84: 3097-3102.
- Kauffman, S. (1993) *The Origins of Order*. Oxford: Oxford University Press.
- Kitcher, P. (1982) *Abusing Science*. Cambridge, Mass.: The MIT Press.
- Kenyon, D. and Steinman, G. (1969) *Biochemical Predestination*. New York: McGraw- Hill.
- Kenyon, D. and Davis, P.W. (1993) *Of Pandas and People: the Central Question of Biological Origins*. Dallas: Haughton.
- Kenyon, D. and Mills, G. (1996) "The RNA World: A Critique". *Origins & Design* 17 (1): 9-16.
- Kerr, R. (1980). "Origin of life: new ingredients suggested". *Science* 210: 42-3.
- Knoll, A.H. and Barghoorn, E.S. (1977). "Archean microfossils showing cell division from the swaziland system of South Africa". *Science* 198: 396-98.
- Kok, R.A., Taylor, J.A., and Bradley, W.L. (1988) "A statistical examination of self-ordering of amino acids in proteins". *Origins of Life and Evolution of the Biosphere* 18: 135-42.
- Kuppers, B. (1990) *Information and the Origin of Life*. Cambridge, Mass.: MIT Press.
- Landsberg, P.T. (1964). "Does quantum mechanics exclude life?" *Nature* 203: 928-30.
- Lehninger (1975). *Biochemistry*. New York: Worth Publishers.
- Lemmon, R. (1970). "Chemical evolution". *Chem. Rev.* 70: 95-6.
- Lowe, D.R. (1980). "Stromatolites 3,400-myr old from the archaean of Western Australia". *Nature* 284: 441-43.
- Lodish, H., Baltimore, D. et. al. (1994) *Molecular Cell Biology*. New York: W.H. Freeman.
- Macnab, R. (1978) "Bacterial mobility and chemotaxis: the molecular biology of a behavioral system". *CRC Critical Reviews in Biochemistry* 5: 291-341.
- Maher, K. and Stevenson D. (1988) "Impact frustration of the origin of life". *Nature* 331: 612-14.

McDonough, Thomas R. (1987) *The Search for Extraterrestrial Intelligence: Listening for Life in the Cosmos*. New York: Wiley.

Meyer, S.C., (1996). "Demarcation and design: The nature of historical reasoning", in *Facets of Faith and Science* Volume IV: Interpreting God's Action in The World, University Press of America.

Meyer, S.C., (1994). "Laws, causes and facts: a response to Professor Ruse," in *Darwinism: Science or Philosophy*. ed. by Buell, J. and Hearn, G. Foundation for Thought and Ethics: Dallas. pp. 29-40.

Meyer, S.C., (1994). "The methodological equivalence of design and descent: Can there be a scientific theory of creation?" in *The Creation Hypothesis*. Edited by Moreland, J.P, Intervarsity Press: Downers Grove. pp. 67-112, 300-312.

Meyer, S.C. (1993), "A scopes trial for the '90s". *The Wall Street Journal*, December 6, p. A14. See also, "The Harmony of Natural Law", January 17th, *Letters to the Editor* Section, p. A9.

Meyer, S.C. (1990) *Of Clues and Causes: a Methodological Interpretation of Origin of Life Studies*. Cambridge University Ph.D. Thesis.

Miller, S.L. (1953). "A production of amino acids under possible primitive earth conditions". *Science* 117: 528-9.

Mora, P.T. (1963) "Urge and molecular biology". *Nature* 199: 212-19.

Mora, P.T. (1965) "The folly of probability". *The Origins of Prebiological Systems and of their Molecular Matrices*, S.W. Fox (Ed.), pp.39-64, 310-15. New York: Academic Press.

Moreland, (ed.), (1994) *The Creation Hypothesis*. Downers Grove, Il.: Intervarsity Press.

Morowitz, H.J. (1966) "The minimum size of the cell". In Wostenholme. In: *Principles of Biomolecular Organization*. O'Connor and Churchill (Eds), pp. 446-59. London.

Morowitz, H.J. (1968) *Energy Flow in Biology*. New York: Academic Press.

Oparin, A.I. (1938) *The Origin of Life*. Translated by S. Morgulis. New York.

Oparin, A.I. (1968). *Genesis and Evolutionary Development of Life*. Translated by Eleanor Maass. New York.

Orgel, L.E. (1973). *The Origins of Life on Earth*. New York: John Wiley.

Pattee, H.H. (1970) "The problem of biological hierarchy". In: *Towards a Theoretical Biology*. C.H. Waddington (Ed.) Vol. 3: 117-36. Edinburgh: Edinburgh University Press.

Patterson, W. (1987). *Mathematical Cryptology for Computer Scientists and Mathematicians*. Totowa, N.J.: Rowman & Littlefield.

Prigogine, I., Nicolis, G. and Babloyantz, A. (1972). "Thermodynamics of evolution". *Physics Today*. November: 23-31.

Prigogine, I., and Nicolis, G. (1977) *Self Organization in Nonequilibrium Systems*. New York: John Wiley.

Polanyi, M. (1967) "Life transcending physics and chemistry". *Chemical Engineering News*, August 21, pp. 54-66.

Polanyi, M. (1968) "Life's irreducible structure". *Science*: 160: 1308-1312.

Reidhaar-Olson, J. and Sauer, R. (1990) "Functionally acceptable substitutions in two alpha-helical regions of lambda repressor". *Proteins: Structure, Function, and Genetics* 7: 306-316.

Pflug, H.D. and Jaeschke-Boyer, H. (1979). "Combined structural and chemical analysis of 3,800-yr-old microfossils". *Nature* 280: 483-85.

Ruse, M., (1982) "Creation science is not science". *Science, Technology and Human Values* Vol. 7, no.40, pp.72-78.

Schopf, J.W. and Barghoorn, E.S. (1967). "Alga-like fossils from the early precambrian of South Africa". *Science* 156: 508-11.

Scriven, M. (1959a). "Explanation and prediction in evolutionary theory". *Science* 130: 477-82.

Scriven, M. (1966). "Causes, connections and conditions in history". In W. Dray (ed.) *Philosophical Analysis and History*, pp.238-64. New York.

Smith, J. Maynard (1979). "Hypercycles and the origin of life". *Nature* 280: 445-46.

Scott, A. (1986) *The Creation of Life*. Oxford.

Shapiro, R. (1986). *Origins*. London: Heinemann.

Shapiro, R. (1988) "Prebiotic ribose synthesis: A critical analysis". *Origins of Life and Evolution of the Biosphere* 18: 71-85.

Smith, J. Maynard (1979) "Hypercycles and the origin of life". *Nature* 280: 445-46.

Sober, E. (1988) *Reconstructing the Past*. Cambridge: M.I.T. Press. S

teinman, G. (1967). "Sequence generation in prebiological peptide synthesis". *Arch. Biochem. Biophys.* 121: 533-39.

Steinman, G. and Cole, M.N. (1967). *Proc. Nat. Acad. Sci. U.S.* 58: 735-41.

Thaxton, C., Bradley, W. and Olsen, R. (1992). *The Mystery of Life's Origin*. Dallas: Lewis and Stanley.

Thaxton, C., and Bradley, W. (1994). "Information and the origin of life". *The Creation Hypothesis*. Edited by Moreland, J.P, Intervarsity Press: Downers Grove. pp. 173-210.

Von Neumann, (1966) *Theory of Self-reproducing Automata*. Edited and completed by A. Berks. Urbana, Il.: University of Illinois Press.

Walker, J.C.G. (1977). *Evolution of the Atmosphere*. New York: Macmillan.

Walker, J.C.G. (1978). *Pure Applied Geophysics* 116: 222.

Walter, M.R., Buick, R. and Dunlop, J.S.R. (1980). "Stromatolites 3,400-3,500 myr old from the North Pole area, Western Australia". *Nature* 284: 443-45.

Walton, J.C. (1977) "Organization and the origin of life". *Origins* 4: 16-35.

Watson, J. and Crick, F. (1953). "A structure for deoxyribose nucleic acid". *Nature* 171: 737-38.

Weiland, C. (1995) "The marvelous 'message molecule'". *Creation* 17 (4) 11-13.

Whitehead, A.N. (1926) *Science and the Modern World*. New York: Macmillan.

Wigner, E. (1961) "The probability of the existence of a self-reproducing unit". *The Logic of Personal Knowledge, Essays Presented to Michael Polanyi*, pp.231ff. London: Kegan and Paul.

Wilford, John N. (1994) "An ancient 'lost city' is uncovered in Mexico". *The New York Times*, Friday February 4, A 10.

Wolfe, S.L. (1993) *Molecular and Cell Biology*. Belmont, California: Wadsworth.

Yockey, H.P. (1977) "A calculation of the probability of spontaneous biogenesis by information theory". *J. Theor. Biol.* 67: 377-98.

Yockey, H.P. (1981) "Self organization origin of life scenarios and information theory". *J. Theor. Biol.* 91: 13-31.

Yockey, H.P., (1992) *Information Theory and Molecular Biology*. Cambridge: Cambridge University Press.

Zaug, A.J. and Cech, T.R. (1986) *Science* 231: 470-75.

Copyright 1996 Stephen C. Meyer. All rights reserved. International copyright secured.  
File Date: 12.29.98

The Discovery Institute

**Critics Rave Over Icons of Evolution: A Response to Published Reviews**

**By Jonathan Wells, Ph.D.**

The original copy of this document is hosted at [The Discovery Institute](http://TheDiscoveryInstitute.com).

When my book *Icons of Evolution* was published in 2000, critics greeted it with rave reviews. I have been truly amazed at the outpouring of warmth from some of my fellow scientists, who have been trying to outdo each other in the superlatives they bestow on my work.

In my case, however, “rave review” doesn’t mean extravagant praise, but wild and furious denunciation; the outpouring of warmth has been a firestorm of vilification; and if the superlatives become any more spiteful I may have to enter the witness protection program.

It seems that I am guilty of the one unforgivable sin in modern biology: I am openly critical of Darwinian evolution. In *Icons* I pointed out that the best-known “evidences” for Darwin’s theory have been exaggerated, distorted or even faked. I argued that a theory that systematically distorts the evidence is not good empirical science--perhaps not even science at all. In fact, Darwinism has all the trappings of a secular religion. Its priests forgive a multitude of sins in their postulants--manipulating data, overstating results, presenting assumptions as though they were conclusions--but never the sin of disbelief.

One high priest of Darwinism, Oxford Professor Richard Dawkins, wrote in 1989: “It is absolutely safe to say that if you meet somebody who claims not to believe in evolution, that person is ignorant, stupid or insane (or wicked, but I’d rather not consider that).” [1] As far as I know my critics have not yet called me insane--perhaps because they feel it’s politically incorrect to bad-mouth the mentally ill, or perhaps because they might then have to let me off by reason of insanity. For the past year and a half, however, defenders of Darwin’s faith have been roasting me for being ignorant, stupid and wicked.

I confess that as a former Berkeley anti-war protestor I enjoy controversy, at least when I think I’m right. To someone like me (as Oscar Wilde once quipped), the only thing worse than being talked about is not being talked about. And talked about I am. The Internet is buzzing with reviews of my book. Amazon.com alone lists 84 as of this writing, and there are more on various other web sites. Rather than deal with the seemingly endless Internet reviews, however (many of which make similar points, anyway), I limit myself here to seven critical reviews written by biologists and published in periodicals:

Larry D. Martin, “An Iconoclast for Evolution?” *The World & I* (February, 2001): 241-246.

Jerry A. Coyne, “Creationism by Stealth,” *Nature* 410 (April 12, 2001): 745-746.

Massimo Pigliucci, “Intelligent Design Theory,” *BioScience* 51:5 (May, 2001): 411-414.

Eugenie C. Scott, “Fatally Flawed Iconoclasm,” *Science* 292 (June 22, 2001): 2257-2258.

David Ussery, “The Stealth Creationists,” *Skeptic* 8:4 (2001): 72-74.

Rudolf A. Raff, “The Creationist Abuse of Evo-Devo,” *Evolution & Development* 3:6 (November-December, 2001): 373-374.

Kevin Padian and Alan Gishlick, "The Talented Mr. Wells," *The Quarterly Review of Biology* 77:1 (March, 2002): 33-37.

Anyone reading (and believing) these reviews would judge me ignorant, and stupid, and wicked. Let's look at each of these charges in turn.

## **WELLS IS IGNORANT**

To be ignorant is to be uninformed. According to some of my reviewers, I am embarrassingly uninformed about at least six of the ten icons of evolution: the Miller-Urey experiment, Darwin's tree of life, Haeckel's embryos, peppered moths, four-winged fruit flies, and ape-to-human evolution.

### **(a) The Miller-Urey experiment**

To show how amino acids--life's building-blocks--could have formed on the early Earth, the 1953 Miller-Urey experiment used a simulated hydrogen-rich atmosphere of methane, ammonia, hydrogen and water vapor. By 1970, though, most geochemists were convinced that the Earth's primitive atmosphere was nothing like this, but instead consisted of gasses emitted from volcanoes--mainly carbon dioxide, nitrogen and water vapor. [2]

According to reviewer David Ussery, however, I failed to notice that "Miller himself describes his own more recent experiments under the conditions now believed to be those of the primitive atmosphere, where he found he could still generate many organic compounds." (Ussery, p. 73)

I would thank Ussery for setting me straight, except that the organic compounds that are produced in this fashion are not amino acids. Instead, when a mixture of carbon dioxide, nitrogen and water vapor is used in a Miller-Urey-type experiment, the reaction products tend to be toxic chemicals such as formaldehyde and cyanide.

This is not late-breaking news. As I pointed out in my book, Sidney Fox and Klaus Dose reported in 1977 that no amino acids are produced by sparking a carbon dioxide-nitrogen-water vapor mixture. In 1983, Miller himself reported that he could produce no more than a small amount of the simplest amino acid (glycine) by sparking an atmosphere containing carbon monoxide and carbon dioxide, and then only if free hydrogen was added. And Miller conceded that glycine was the best he could do in the absence of methane. In 1984, Heinrich Holland confirmed that mixtures of carbon dioxide, nitrogen and water vapor yield no amino acids at all. [3] Perhaps Ussery was ignorant of these facts.

Reviewers Larry Martin and Massimo Pigliucci argue that the Miller-Urey experiment has nothing to do with biological evolution, anyway. Martin is "a bit puzzled why this chapter [on Miller-Urey] was included, as the origin of life does not seem to be an evolutionary question." (Martin, p. 242) And Pigliucci writes: "The Miller experiments and the whole question of the origin of life have nothing to do with the truth, or lack thereof, concerning evolutionary theory." (Pigliucci, p. 413)

If I am mistaken on this point, however, I must blame my biology textbooks--all of which include the origin of life and the Miller-Urey experiment in their treatments of evolution. For example, Campbell, Reece and Mitchell's *Biology*, a widely used introductory college



textbook, discusses the Miller-Urey experiment in its unit on “The Evolutionary History of Biological Diversity.” The Miller-Urey experiment is also standard fare in upper division and graduate-level textbooks devoted entirely to biological evolution, such as Futuyma’s *Evolutionary Biology* and Freeman and Herron’s *Evolutionary Analysis*. [4] Perhaps Martin and Pigliucci should inform the authors of these textbooks that the origin of life has nothing to do with evolution--then biologists such as I will not be so misinformed.

Reviewers Kevin Padian and Alan Gishlick, on the other hand, seem to think that the origin of life is relevant to evolution, but they take me to task for being ignorant of current studies on primordial oxygen and their relevance to the Miller-Urey experiment. First they argue that “there was little free oxygen” on the early Earth. To prove this, they cite an article by a freelance science writer about the continuing controversy over primitive oxygen levels. (Padian & Gishlick, p. 34)

My claim in *Icons of Evolution*, however, was that the issue of primitive oxygen remains controversial--a claim amply supported by the article Padian and Gishlick cite. [5] The problem with biology textbooks is that they routinely ignore the controversy and tell students that because the Miller-Urey experiment doesn’t work in the presence of oxygen there must not have been any oxygen on the early Earth. This is putting the cart before the horse: Demonstrating the absence of oxygen is necessary to establish the relevance of the experiment; assuming the relevance of the experiment doesn’t demonstrate the absence of oxygen.

Apparently wanting to cover all their bases, Padian and Gishlick argue that the controversy over primitive oxygen doesn’t matter anyway, because “amino acids could be synthesized even if small amounts of oxygen were present.” (Padian & Gishlick, p. 34)

To support this claim Padian and Gishlick cite another article--this one, at least, written by a scientist rather than a science writer. But the article’s only support for their claim is a secondhand reference to an obscure report from Slovakia. If the Slovakian report is right, this means that defenders of the Miller-Urey experiment can relinquish their cart-before-the-horse reasoning--but only if they first concede that what they have been telling students for years about the inhibitory role of oxygen is false. [6]

Having said this, I nevertheless admit that I am quite ignorant about the origin of life. But so is everyone else. Isn’t it time we admitted our ignorance to our students, instead of continuing to give them the impression that the Miller-Urey experiment shows how life’s building-blocks could have originated on the early Earth?

#### (b) Darwin’s tree of life

According to Darwin’s theory, all living things are modified descendants of one or a few original forms. If the theory were true, then the history of life would begin with an original ancestral species diverging into two different species, then different genera, different families, and so on--with major differences appearing only after millions of generations. The resulting pattern would be like a branching tree--what Darwin called the “great Tree of Life.”

Yet when animals first appear in the fossil record at the beginning of the geological period known as the Cambrian, most of the major differences--the basic body plans, or “phyla”--are already present. In the modern world, the phyla are represented by mollusks (e.g., snails and

octopuses), arthropods (e.g., crabs and insects), echinoderms (e.g., starfish and sea urchins), chordates (e.g., fish and humans), and various kinds of worms, among others. These and many other phyla appeared in what is now known as the “Cambrian explosion” with an abruptness that is inconsistent with a branching-tree pattern. Darwin himself acknowledged it to be a serious problem for his theory. [7]

According to reviewer Ussery, however, I am mistaken about the suddenness of the Cambrian explosion, because “we see a gradual change in the fossil record from the earliest bacteria fossils of 3.8 billion years ago... to the Cambrian fossils of about 500 million years ago.” Thus “there is a large body of fossil evidence supporting evolution.” (Ussery, p. 73) Reviewers Padian and Gishlick similarly argue that “there is nothing ‘sudden’ about metazoan [i.e., multicellular animal] appearances in the Cambrian,” because “metazoan eggs, embryos, and bilaterian trace fossils [tracks apparently made by burrowing worms]... are present at least 40 (and maybe as many as 70) million years before the Cambrian ‘explosion’.” (Padian & Gishlick, p. 35)

But the three billion years to which Ussery refers show only single-celled organisms until just before the Cambrian explosion. Not single-celled organisms gradually becoming multicellular animals--just single-celled organisms. The animal eggs and embryos mentioned by Padian and Gishlick are sponges--one phylum that everyone agrees (and I point out in my book) was present before the Cambrian explosion. And the burrowing worms which presumably made trace fossils may have represented one more phylum that appeared just before the Cambrian. (Some experts think there may also have been jellyfish just before the Cambrian.) So not all animal phyla appeared suddenly in the Cambrian explosion--just most of them.

To put “gradual” and “sudden” in context here, imagine yourself standing at one end of a football field. Let the goal line where you are standing represent 3.8 billion years ago (when single-celled organisms are thought to have originated), and let the other end of the football field represent the present day. As you walk from one goal line to the other, you see only single-celled organisms as you pass the 25-yard line, then midfield, then the 75-yard line. Only as you approach the 84-yard line do you notice the first multicellular organisms--some sponges, and perhaps some worms and jellyfish. Then, in the space of a single stride, most of the other animal phyla appear, and most of these are still with you when you reach the other goal line.

This is not a branching tree pattern: no animals for 5/6 of the history of life, then most modern body plans in a flash. Some paleontologists have aptly compared this pattern to a “lawn” instead of a tree. [8]

Reviewer Eugenie Scott also argues that I am mistaken about the suddenness of the Cambrian explosion, not because there is a long history of animal evolution before the Cambrian, but because many major groups appear after the Cambrian. According to Scott, “the implication that most modern phyla and classes occur in the Cambrian... doesn’t hold true for either animals or plants. Wells neglects to mention that insects, amphibians, reptiles, birds and mammals are all post-Cambrian.” (Scott, p. 2258)

But I never implied that the Cambrian explosion included plants; indeed, there is no such thing as a plant phylum (the major groups of plants are called “divisions”). Nor did I ever imply that “insects, amphibians, reptiles, birds and mammals” appeared in the Cambrian explosion--though the phyla to which these organisms belong (arthropods and chordates) did

appear abruptly in the Cambrian. So what Scott criticizes is something I never claimed. She can't fault me for stuff I did write, so she tries to fault me for stuff I didn't write.

Taking the opposite tack from Scott, reviewer Martin implicitly acknowledges that the major groups of animals did appear at the outset, but he argues that this is exactly what we would expect. Martin writes: "Actually, the fossil record and theory make a good fit. The higher a unit of classification is placed in the hierarchy, the earlier it is supposed to have appeared in time. Phyla are higher taxonomic levels and might be expected to appear before modern classes and orders. That is exactly what we see." (Martin, p. 243)

But Martin is looking through the wrong end of the telescope. He sees a single phylum and surmises correctly that Darwin's theory predicts the initial appearance of one or a few species in that phylum, followed by diversification into many different species within the same phylum. The problem with the Cambrian explosion, however, is that more than a dozen phylum-level designations appear together at the outset. Where is the evidence that they evolved from a single ancestral phylum, as Darwin's theory claims?

Padian and Gishlick, like Martin, also suggest that it is not surprising to see phylum-level differences appear suddenly at the beginning of the Cambrian. This is rather comical, since Padian and Gishlick just finished arguing that there is nothing sudden about the Cambrian explosion. Covering all their bases once again, they claim that recent advances in genetics explain how body plans emerged relatively suddenly: "Wells entirely overlooks the explosive field of evolutionary developmental biology when he ignores the fact that evolutionary theory does not require the slow accumulation of small changes to produce body plan differences. Relatively early-acting, small, genetic changes in genes that affect features of body plans such as axis orientation, segmentation, and appendage formation can have substantial and immediate phenotypic effects. This is especially surprising because Wells wrote his Ph.D. dissertation on embryology." (Padian & Gishlick, p. 35)

It certainly would be surprising if I had entirely overlooked my own field. Fortunately for my reputation, however, Padian and Gishlick are mistaken in their claim that I ignore "early-acting, small genetic changes" in development: I discuss them in my treatment of the four-winged fruit fly icon, below.

Now, I acknowledge that Martin and Padian are fossil experts, and I'm not. I freely admit my ignorance about the fine details of their field, vertebrate paleontology. But the geologically abrupt appearance of most animal phyla (not just vertebrates) in the Cambrian explosion is not a fine detail; it is one of the most obvious and undeniable features of the fossil record. Changing the subject from animals to bacteria or plants, pointing out that sponges are an exception to the other phyla, and playing semantic games with taxonomic terminology cannot alter this brute fact.

### (c) Haeckel's embryos

Aware of the problems with the fossil record, Darwin thought that the best evidence for his theory came from embryology. He believed that early vertebrate embryos "are closely similar, but become, when fully developed, widely dissimilar." He concluded that this was not just evidence for common ancestry--it was "by far the strongest single class of facts in favor of" his theory. In the 1860s, German Darwinist Ernst Haeckel made drawings of vertebrate embryos to illustrate these "facts." Yet (as his contemporaries pointed out) Haeckel faked his

drawings: Vertebrate embryos actually start out looking very different, then converge somewhat in appearance midway through development before becoming more different again as adults. Haeckel misrepresented the midpoint of development as the first stage, then he distorted the embryos at this point to make them look much more similar than they really are. [9]

Reviewer Jerry Coyne focuses most of his remarks (at least, most of the few that actually deal with science) on my treatment of vertebrate embryos--a daring move on his part, since I'm a vertebrate embryologist and he's a fruit fly geneticist. Coyne begins by re-stating the standard view: "As Darwin first realized, some aspects of vertebrate development--especially transitory features--provide strong evidence for common ancestry and evolution. Embryos of different vertebrates tend to resemble one another in early stages, but diverge as development proceeds, with more closely related species diverging less widely. This conclusion has been supported by 150 years of research." Coyne then takes me to task for foolishly trying "to refute this mountain of work." (Coyne, p. 745)

Naturally, I would be grateful to Coyne for correcting me about this--if he were right. But his claim that vertebrate embryos are most similar in their early stages is dead wrong. As British zoologist Adam Sedgwick wrote in 1894, the claim is "not in accordance with the facts of development." Comparing a dogfish with a chicken, Sedgwick wrote: "There is no stage of development in which the unaided eye would fail to distinguish between them with ease." It is "not necessary to emphasize further these embryonic differences," Sedgwick continued, because "every embryologist knows that they exist and could bring forward innumerable instances of them. I need only say with regard to them that a species is distinct and distinguishable from its allies from the very earliest stages all through the development." (Emphasis in the original) [10]

Many other vertebrate embryologists have noted the same thing. In 1976, Dartmouth College embryologist William Ballard wrote that it is "only by semantic tricks and subjective selection of evidence," by "bending the facts of nature," that one can argue that the earliest stages of vertebrate embryos "are more similar than their adults." And in 1987, Canadian embryologist Richard Elinson wrote that early developmental patterns in frogs, chicks and mice are "radically different." [11]

So the "mountain of work" Coyne invokes actually buries his claim. But that doesn't seem to bother him, because (in a cover-all-your-bases move worthy of Padian and Gishlick) he acknowledges that vertebrate embryos are not most similar in their early stages: "Wells also notes that the earliest vertebrate embryos (mere balls of cells) are often less similar to one another than they are at subsequent stages when they possess more complex features." Like other evolutionary biologists, Coyne argues that the dissimilarity of early vertebrate embryos can be explained in the light of Darwin's theory, since "the earliest stages of vertebrate embryos show adaptation" to the conditions of their existence. Coyne even regards this as evidence for the theory: "Wells repeatedly fails to grasp the evidential value of phenomena [i.e., dissimilarities in early embryos] that can be understood only as the result of a historical process." (Coyne, p. 745)

So let me get this straight. Some of the strongest evidence for Darwin's theory is that vertebrate embryos are most similar in their early stages--except that they're not. But if we just interpret the embryos' dissimilarities in the light of Darwin's theory, they then have "evidential value."

Oh, now I get it! Darwin's theory wins no matter what the evidence shows. Apparently I was just ignorant of how evolutionary biology works.

#### (d) Peppered moths

Peppered moths come in a light variety and a dark variety. Before 1800 the light variety was ubiquitous, but during the industrial revolution the dark variety became much more common. According to evolutionary theory, the shift occurred because of natural selection: Dark moths were better camouflaged against pollution-darkened tree trunks, and thus more likely to survive bird predation. In the 1950s, British physician Bernard Kettlewell released captive moths onto nearby tree trunks and observed as birds ate the more visible ones. He then released moths that had been marked on the underside with a tiny spot of paint. When he later recaptured some of the marked moths, the proportion matching the color of nearby tree trunks was significantly higher than in the batch he had released, consistent with the camouflage-predation theory. The peppered moth story soon became the classic textbook case of natural selection in action.

In the 1980s, however, scientists discovered that peppered moths rarely rest on tree trunks in the wild, and a growing number of biologists now question the classic story. For example, University of Chicago evolutionary biologist Jerry Coyne (yep, the same Coyne cited above) wrote in 1998: "From time to time, evolutionists re-examine a classic experimental study and find, to their horror, that it is flawed or downright wrong." According to Coyne, the fact that peppered moths do not rest on tree trunks "alone invalidates Kettlewell's release-and-recapture experiments, as moths were released by placing them directly onto tree trunks." [12]

Several reviewers of *Icons of Evolution* (not including Coyne, of course) fault me for getting the moths' resting-places wrong. According to Scott, "Wells argues that moths don't rest on tree trunks," but "he ignores research showing that moths rest on all parts of trees (including the trunks)." (Scott, p. 2258) And Padian and Gishlick write: "Wells erroneously claims that moths do not rest on tree trunks, although research has shown that moths rest on trunks 26% of the time, and on trunk/branch junctions 43% of the time (Majerus 1998, p 123)." (Padian & Gishlick, p. 36)

But Scott doesn't cite any research, and the research she says I ignore shows clearly that exposed tree trunks are not the natural resting-places of peppered moths. For example, in 1984 Kauri Mikkola reported that "the species probably only exceptionally rests on tree trunks;" and in 1987 Rory Howlett and Michael Majerus wrote that they were "convinced that exposed areas of tree trunks are not an important resting site" for peppered moths. [13]

What about the statistics Padian and Gishlick attribute to Majerus? Majerus's 1998 book lists a total of 47 moths found in the wild from 1964 to 1996. Of these, 6 were found on exposed tree trunks, 6 on unexposed trunks, 20 in trunk/branch joints, and 15 on branches. Padian and Gishlick obtain their percentages from the first two categories (13% plus 13%) and the third category (43%). But Majerus's 47 moths are not--and are not claimed to be--an unbiased sample representing peppered moths in general. In the decades since Kettlewell's experiments, scientists have counted tens of thousands of peppered moths; one 1977 paper alone listed data for 8,426 moths in southern Britain between 1952 and 1974. [14] These thousands, however, were found in artificial traps, not in normal resting positions. Researchers suspect that the moths normally spend the day hidden under horizontal branches high in the trees, where they cannot be seen.

So even if all 47 of Majerus's moths had been found on tree trunks, they would still represent less than 1% of all peppered moths studied during the same period. Trying to determine the normal resting-places of peppered moths by doing statistics on Majerus's sample is a bit like trying to determine the normal habitats of ocean fish by doing statistics only on those spotted from a boat. But of course Majerus knows this, which is why he (unlike Padian and Gishlick) concludes that "peppered moths do not naturally rest in exposed positions on tree trunks."  
[15]

Before biologists discovered that peppered moths don't normally rest on tree trunks, many experiments were conducted by pinning or gluing dead moths to tree trunks. This practice should have been abandoned, however, once biologists knew that it fails to test the camouflage-predation theory under natural conditions. In *Icons of Evolution*, I criticized textbooks that continue to use staged photos of moths on tree trunks to illustrate natural selection--though I stopped short of calling them "fraudulent."

Yet according to Scott: "Researchers glued moths to trees to test whether birds differentially prey upon moths that contrasted against their surface, an experiment necessary to test the hypothesis of bird predation. This is not fraud, it's research." (Scott, p. 2258) And Padian and Gishlick write: "Wells then pretends righteous indignation about 'fraudulent,' 'staged' textbook photographs of light and dark moths against light and dark backgrounds. But these photographs merely illustrate the differential camouflage that field experiments tested--a reasonable and expected part of science. Can Wells be so ignorant of this investigative tradition or the purpose of an illustration?" (Padian & Gishlick, p. 36)

In the investigative tradition that I was taught, however, field research is supposed to approximate natural conditions as closely as possible. Since the surface on which peppered moths rest is a key factor in the camouflage-predation theory, the tradition I learned would require that experiments be conducted using the moths' normal resting-places--and that textbook illustrations portray those resting-places accurately.

Apparently, evolutionary biology relies on a different investigative tradition--one in which understanding nature is less important than finding ways to prop up Darwin's theory. Maybe Padian and Gishlick are right, and I was ignorant of that tradition. But I'm learning.

#### (e) Four-winged fruit flies

According to neo-Darwinism (the modern form of Darwin's theory), evolution results primarily from two factors: natural selection, which acts on variations already present in a population, and genetic mutations, which supposedly provide new variations which then become raw materials for evolution.

Since natural selection favors variations that benefit the organism, and tends to eliminate those that harm it, only beneficial mutations can provide raw materials for evolution. Some mutations benefit certain organisms by enhancing their ability to resist toxins (antibiotic resistance in bacteria is perhaps the best-known example of this). Such mutations typically act by deforming a molecule involved in the organism's response to the toxin. Since organisms with the deformed molecule may survive in the presence of the toxin while others perish, such mutations are favored by natural selection. But Darwinian evolution needs a lot more than deformed molecules to explain the origin of new organs and body plans--it needs beneficial changes in anatomy.

To show how genetic mutations can provide raw materials for anatomical evolution, many biology textbooks feature pictures of a four-winged fruit fly. Fruit flies normally have two wings and two “balancers”--tiny appendages behind the wings that enable the insect to stabilize itself in flight. A skilled geneticist, however, can combine three separate DNA mutations to produce a fly in which the balancers are transformed into a normal-looking second pair of wings. Since some insects have four wings instead of two, the four-winged fruit fly seems at first glance to provide evidence for how one kind of insect evolved into another.

As I pointed out in *Icons of Evolution*, however, fruit flies with four normal-looking wings do not occur in nature; they must be engineered in a modern genetics laboratory. Furthermore, the extra wings have no muscles, so the mutant fly is a hopeless cripple that has great difficulty flying or mating. Outside the laboratory, natural selection would quickly eliminate it. Far from being raw material for evolution, the four-winged fruit fly is an evolutionary dead end. [16]

Reviewer Raff objects to my characterization of this icon: “Wells misuses the science he learned at Berkeley,” he writes, since “despite some pictures of suitably iconic four-winged *Drosophila* [the generic name for fruit flies], the discussion of genes and development in *Icons of Evolution*“ is “shabby and misleading.” (Raff, p. 374)

Raff doesn’t say exactly what he finds shabby and misleading. Presumably, though, it’s not my discussion of genes and development in four-winged fruit flies, since that part of my chapter was reviewed before publication by none other than Edward B. Lewis, the Nobel Prize-winning geneticist who made the first four-winged fruit fly. Although Lewis doesn’t endorse my criticisms of Darwinian evolution, he was kind enough to help me get my facts right.

Reviewers Padian and Gishlick (as we saw above in the discussion of the Cambrian explosion) object that “Wells entirely overlooks the explosive field of evolutionary developmental biology when he ignores the fact that... relatively early-acting, small, genetic changes in genes [can] affect features of body plans such as axis orientation, segmentation, and appendage formation.” (Padian & Gishlick, p. 35)

Since my entire chapter on four-winged fruit flies dealt with genetic changes that affect appendage formation, it’s difficult to see how Padian and Gishlick justify their claim that I ignore them. But if mutations affecting appendage formation are a problem for neo-Darwinism, mutations affecting axis formation and segmentation are even worse. As I pointed out in my book, developmental geneticists in the 1970s and 1980s used a technique known as “saturation mutagenesis” to screen for all possible mutations affecting embryo development in the fruit fly. Although this work shed considerable light on the role of genes in development (and led to some well-deserved Nobel Prizes), it also showed that mutations affecting axis formation and segmentation are invariably harmful, and indeed often fatal. [17] Such mutations cannot provide raw materials for evolution.

Reviewer Ussery feels that my ignorance of molecular biology extends further than developmental genetics. He writes: “Does Wells really believe that it is not true that DNA makes RNA makes protein?... I am seriously concerned that Wells claims himself to be a molecular biologist.” (Ussery, p. 74)

Of course, I have never implied that DNA doesn't make RNA, or that RNA doesn't make protein. In fact, a main point of my chapter on the four-winged fruit fly is precisely that DNA (through RNA) does make proteins--but that proteins alone are insufficient to specify the body plan of an organism, just as building materials are insufficient to specify the floor plan of a house. Defective 2x4's can produce a deformed house, and mutant proteins can produce a deformed organism. Mutant proteins might even explain how some organisms might have lost previously existing features. But they do not account for changes in body plans. When it comes to the evolution of new morphologies or body plans, the question remains: Where is the evidence that DNA mutations can alter anatomy in beneficial ways and thereby provide raw materials for evolution?

It seems to me that this is a reasonable question. Despite my Berkeley Ph.D., I certainly don't know everything about genes, development and evolution (after all, who does?). But until I actually see some good evidence for beneficial anatomical mutations, I'll keep asking the question.

Come to think of it, shouldn't all biologists be asking it?

#### (f) Human evolution

The evidence for human evolution will always be meager in comparison with evidence drawn from other species. Experiments involving mutation and selection that can be performed with bacteria, animals and plants cannot be done with humans, because they would be both impractical and unethical. So evidence for the processes of evolution necessarily comes from organisms other than human beings.

As for patterns in the history of life: The vast majority of animal fossils are marine invertebrates. Fossils of land vertebrates are comparatively few and far between, and fossils of the ape-like creatures that supposedly evolved into humans are so exceedingly rare that their discovery is usually announced on the front pages of newspapers.

According to Scott, I exaggerate the scarcity of fossil relating to human origins. She complains that I ignore "the many significant discoveries of the past two decades," giving readers the incorrect impression that "the human fossil record is unusually weak." (Scott, p. 2258) Yet Martin writes: "Wells seems to accept the fossil evidence at face value," so that the story of human evolution "remains intact using evidence that he allows." (Martin, pp. 244-245) Coyne's only objection is that I can "only mumble" when "faced with a series of hominid fossils showing transitions from ape-like to modern human traits over 4 million years." (Coyne, p. 745) And Pigliucci writes: "Wells, as much as he desperately tries to debunk" the ape-to-human icon, "is backed against the wall by his own knowledge" of the fossil record. (Pigliucci, p. 413)

So reviewers Martin, Coyne and Pigliucci don't think that I'm ignorant of the fossil evidence for human origins; they complain that I'm unwilling to grant that it demonstrates Darwinian evolution. And they're right: Although a series of fossils may be consistent with Darwin's theory of descent with modification, I do not think it is sufficient evidence for that theory. And I'm not the only biologist who thinks this.

Henry Gee, chief science writer for Nature, wrote in 1999: "The intervals of time that separate fossils are so huge that we cannot say anything definite about their possible connection



through ancestry and descent.” Although Gee is a believer in Darwin’s theory, he acknowledged that one must assume the truth of the theory when studying human origins, because by its very nature the fossil record cannot corroborate it. Gee concluded: “To take a line of fossils and claim that they represent a lineage is not a scientific hypothesis that can be tested, but an assertion that carries the same validity as a bedtime story--amusing, perhaps even instructive, but not scientific.” [18]

I would go further than Gee, and point out that a series of fossils is just as consistent with intelligent design as it is with Darwinian evolution. Even if we had a complete fossil record of all animals that lived before the advent of human beings, it would not establish that the latter evolved from the former through descent with modification. This point was unwittingly illustrated by Ohio State University biologist Tim Berra in his 1990 book, *Evolution and the Myth of Creationism*. Berra compared the fossil record to a series of automobile models: “If you compare a 1953 and a 1954 Corvette, side by side, then a 1954 and a 1955 model, and so on, the descent with modification is overwhelmingly obvious. This is what paleoanthropologists [people who study human origins] do with fossils.” (Emphasis in the original) [19]

But we all know that automobiles are designed, so Berra’s analogy makes it clear that a sequence of fossil forms can be explained just as well by design as by Darwinian evolution. This is why one must first assume Darwin’s theory in order to get an evolutionary story out of the fossil evidence. [20] As Gee acknowledged, however, such a story is untestable, and thus has no more scientific validity than a bedtime story.

(g) Wells is factually accurate

In my humble opinion, my critics have failed to show that my disbelief in Darwinian doctrine is due to ignorance of the facts. Indeed, reviewer Martin acknowledges that *Icons of Evolution* “is factually accurate.” He concludes: “If Wells made a technical error, I missed it.” (Martin, pp. 242, 246)

At the same time, I freely admit my ignorance about many things. I am ignorant of how life originated--but so is everybody else. I am ignorant of many details of the fossil record--but the abrupt appearance of major animal groups in the Cambrian explosion is not a detail, it is one of the fossil record’s most obvious features. I am ignorant of many aspects of vertebrate embryology, despite my Ph.D. in the field--but I do know that what Darwin called the “strongest single class of facts” in favor of his theory is not factual at all. I am ignorant about many things concerning peppered moths--but I know enough about the “investigative tradition” in science to recognize the phoniness of statistics “proving” that the moths rest where experts say they don’t. I am ignorant of many things in developmental genetics, despite my Ph.D. training--but I do know that four-winged fruit flies are hopeless monsters, not raw materials for evolution. Finally, I am ignorant of many aspects of human origins--but I know that fossils alone are not sufficient to demonstrate descent with modification.

So the problem is not my ignorance. Perhaps it’s my stupidity. Let’s see.

**WELLS IS STUPID**

Ignorance is a lack of knowledge, but stupidity is a lack of mental ability. A stupid person can't think straight. According to some of my reviewers, I disbelieve in Darwinian evolution because I confuse "unexplained" with "unexplainable," I illogically criticize evolution because of a few textbook mistakes, and I fail to grasp the proper relationship between scientific theories and the evidence.

(a) Confusing "unexplained" with "unexplainable"

One of the icons of evolution I discussed in my book is homology in vertebrate limbs. A bat has wings for flying, a porpoise has flippers for swimming, a horse has legs for running, and a human has hands for grasping, yet the bone structures in their forelimbs are remarkably similar. Pre-Darwinian biologists called these structural similarities "homologies" and attributed them to a common archetype, or design. Darwin attributed them to inheritance from a common ancestor.

How can we determine which is correct? As we saw in Berra's Corvette analogy above, mere similarities are not evidence for ancestry and descent; they are equally compatible with design. The only way to show that the Darwinian explanation of homology is correct is to demonstrate a natural mechanism. Only by showing how one car model could change into another through unguided natural processes (such as rust and wind) could we show that they evolved in a Darwinian fashion, without the need for design.

In the case of living things, two natural mechanisms have been proposed to explain homology: developmental pathways (with homologous features originating from similar cells and processes in the embryo), and genes (with homologous features being programmed by similar DNA sequences). But neither one of these proposed mechanisms fits the evidence: As a general rule, homologous features are not correlated with either similar developmental pathways or similar genes. Therefore, the Darwinian explanation (common ancestry) remains uncorroborated, and the classical alternative (common design) remains a viable option.

Reviewer Raff begins his criticism of my treatment of homology by quoting an essay I wrote with Paul Nelson in 1997: "Homology... cannot be attributed to similar developmental pathways any more than it can be attributed to similar genes. So far, the naturalistic mechanisms proposed to explain homology do not fit the evidence." Raff continues: "What logical gymnastics! If it's unexplained, it must be unexplainable by evolutionary biology. If it's unexplainable by evolutionary biology, it must require an intelligent designer." (Raff, p. 373)

The logical gymnastics, however, are Raff's--not mine. My argument is that the "common ancestry" explanation for homology has not been empirically demonstrated, so the "common design" explanation cannot be ruled out. Is homology "unexplained" by evolutionary biology? Yes. Is it "unexplainable"? I don't know. If homology is unexplainable by evolutionary biology, does it require an intelligent designer? Perhaps, if those are the only two possibilities. But I did not argue this in *Icons of Evolution*. I merely asserted that because Darwinism has not explained homology, it cannot exclude alternative explanations such as intelligent design.

Most biology textbooks, however, give the impression that the issue has been settled. They do this, not by providing evidence, but by defining homology as similarity due to common ancestry. Yet the same textbooks also claim that homology is some of the best evidence for

common ancestry. In effect, they claim that similarity due to common ancestry is due to common ancestry. [21]

Is that what evolutionary biologists mean by thinking straight?

(b) Criticizing evolution because of a few textbook mistakes

According to several of my reviewers, I illogically try to discredit evolutionary theory on the grounds that textbooks contain a few mistakes.

Coyne writes: “Wells’s book rests entirely on a flawed syllogism: hence, textbooks illustrate evolution with examples; these examples are sometimes presented in incorrect or misleading ways; therefore evolution is a fiction.” (Coyne, p. 745) Pigliucci states the same thing, but more strongly: “Because there are omissions, simplifications, and inaccuracies in some general biology textbooks, obviously the modern theory of evolution must be wrong. This is the astounding line of reasoning that is the backbone of Jonathan Wells’s *Icons of Evolution*.” (Pigliucci, pp. 411-412) Padian and Gishlick make the same point even more strongly--heavily seasoned with scorn: “The Whine Expert: Wells reminds us of those kids who used to write to the letters page of Superman comics many years ago. ‘Dear Editor,’ they would write, ‘you made a boo-boo! On page 6 you colored Superman’s cape green, but it should be red!’ Okay, kid, mistakes happen, but did it really affect the story? Wells cannot hurt the story of evolution; like a petulant child, he can only throw tantrums.” (Padian & Gishlick, p. 37)

If the icons of evolution were really just a few textbook “boo-boos,” however, the proper response from evolutionary biologists would be to correct or remove them. In November 2000, John L. Hubisz issued a Packard Foundation report on middle school physical science textbooks. Hubisz found many mistakes in the textbooks, the most-publicized (and funniest) of which was a photograph of singer Linda Ronstadt with a caption identifying her as a silicon crystal doped with arsenic. The caption was supposed to accompany a drawing of a silicon crystal on the following page, but it had been mistakenly shifted to the Ronstadt photograph instead. The publisher immediately moved to correct the mistake in future editions. [22]

Imagine, though, the following scenario: The mis-identification of Ronstadt as a silicon crystal is found year after year, in almost all physics textbooks from middle school up through graduate school; the mis-identification is consistent with other material in the text promoting the theory that human life is based on silicon rather than carbon; and the mis-identification is vigorously defended by advocates of the theory. Obviously, we would no longer be dealing with a textbook mistake, but a systematic effort to promote the theory that human life is silicon-based.

This is what we see with the icons of evolution: Several of them grossly exaggerate or distort the truth, while others are patently false. Yet they are found year after year in almost all textbooks dealing with evolutionary theory, and they invariably accompany other material promoting that theory. When someone points out that the textbook examples misrepresent the facts, Darwinists don’t rush to correct them. Instead, they rush to defend them.

It is not I but my critics who portray the icons of evolution as innocent mistakes--and they do so in order to make me look stupid for allegedly trying to discredit an entire theory because of a few isolated mistakes. In my book, however, I argued that the icons reflect badly on evolutionary theory precisely because they are not isolated mistakes. When my critics defend

the icons (as we saw them do above), they refute their own argument that the icons are simply textbook errors. And when my critics defend the icons by denying the reality of the Cambrian explosion, distorting the facts of vertebrate embryology, misrepresenting the normal resting-places of peppered moths, ignoring the harmful effects of anatomical mutations, and pretending that fossils alone can establish ancestor-descendant relationships, they further substantiate my argument that the icons of evolution are part of a systematic effort to exaggerate, distort, or even fake the evidence to prop up Darwinian theory.

So the icons of evolution are not just “boo-boos.” Maybe I am stupid--but I’m not that stupid.

### c) Failing to grasp the relationship between scientific theories and evidence

According to reviewer Pigliucci, I’m stupid not only because of my “astounding line of reasoning” that finds fault with evolutionary theory on the basis of a few textbook mistakes, but also because I think that removing a few pieces of evidence refutes a scientific theory. He writes: “Perhaps the most damning point about Wells’s book is the general conception of science that emerges from it. Given his scientific training, Wells should have known better. It is clear that the education system at Berkeley has failed in his case.” Pigliucci continues: “Wells’s whole argument hinges on the idea of the crucial proof of a scientific theory. If that pillar falls, the whole enterprise is useless. Now, Wells is far from showing that any of the icons are in fact fundamentally flawed or represent an insurmountable obstacle for evolutionists. But even if he succeeded, Wells’s conception of science is so simplistic as being labeled by philosophers of science as naïve falsificationism. Falsificationism, it may be recalled, is the idea proposed by philosopher Karl Popper.” (Emphasis in the original) (Pigliucci, pp. 413-414)

Popper maintained that a theory is not scientific unless it makes claims that can be falsified--i.e., proven wrong. For Popper, falsificationism is the hallmark of science. Naïve falsificationism, however, looks for isolated anomalies where an otherwise successful theory seems inconsistent with the evidence. Every scientific theory encounters such anomalies; often they turn out to be experimental artifacts, or they disappear as more data are collected. If I were to reject evolutionary theory on the basis of a few isolated anomalies while ignoring mountains of corroborating evidence, Pigliucci would be right to call me a naïve falsificationist.

“The real ‘evidence’ for evolution,” Pigliucci argues, “is not to be found in individual experiments, and it is certainly not to be expected in textbooks for beginning students. Rather, it is found in the plethora of facts about the biotic world that accumulate every year in the primary literature, facts that make no sense outside of the evolutionary paradigm. Components of this paradigm are constantly being tested in countless laboratories around the world, and--for the most part--the theory has withstood the test of time. More important, this is the way science really works.” (Pigliucci, p. 414)

But where are the mountains of evidence for Darwinian evolution? There are two basic elements in the theory: (1) the notion that all living things share common ancestors, and (2) the notion that differences in living things are due mainly to natural selection acting on random variations (with genetic mutations supplying new variations). Darwinists often claim that the first is so well corroborated that we are justified in calling it a “fact,” while the second is acknowledged to be a “theory,” generally well supported but still debated in its details.

Common ancestry is surely true at some levels. We directly observe it within species. All human beings are presumably descended from common human ancestors in the distant past. Members of the cat family can interbreed, so maybe they are descended from a common feline ancestor. But do bacteria, fungi, plants and animals all share a common ancestor? Maybe not. It depends on the evidence.

In *Icons of Evolution*, I questioned the evidence for common ancestry at the level of the animal phyla. The principal lines of evidence are the fossil record, homology, embryology, and molecular comparisons. Yet (as we have seen) one of the most striking features of the fossil record is the Cambrian explosion, which provides no support for the common ancestry of the animal phyla. Homology remains unexplained by evolutionary biology, so even at the level of vertebrate classes it cannot be used to distinguish between common ancestry and common design. And the early embryonic similarities that supposedly demonstrate the common ancestry of the vertebrates turn out to be non-existent, while embryos of other phyla are even less similar.

The evidence from molecular comparisons is also problematic. As biologist Michael Lynch wrote in 1999: “Clarification of the phylogenetic [i.e., ancestor-descendant] relationships of the major animal phyla has been an elusive problem, with analyses based on different genes and even different analyses based on the same genes yielding a diversity of phylogenetic trees.” [23]

Judging from these lines of evidence, the common ancestry of the major animal groups is not a “fact”--it’s not even a well-supported hypothesis. If (as Pigliucci claims) there is other evidence from “countless laboratories around the world,” where is it?

As for the supposed processes of evolution, natural selection and random variation: All observed cases of natural selection (such as Darwin’s finches, another icon discussed in my book) show only minor changes within existing species, like the changes domestic breeders have been observing for centuries. There is no evidence that selection can turn chickens into turkeys, much less turn bacteria into animals. Furthermore, as we saw, the most widely advertised anatomical mutant--the four-winged fruit fly--is an evolutionary dead end.

Selection and mutation have been studied most extensively in bacteria, because it is possible to experiment with millions of organisms and thousands of generations in a relatively short time. Yet as British bacteriologist Alan H. Linton wrote just recently: “Throughout 150 years of the science of bacteriology, there is no evidence that one species of bacteria has changed into another.” [24]

It is precisely because evidence for the two basic elements of Darwin’s theory is so thin that my critics defend the icons of evolution rather than replace them with better examples. Pigliucci and his fellow Darwinists are not protecting their theory from naïve falsificationism--they are protecting it from falsification altogether. One doesn’t have to be a Popperian to see that this is not good empirical science--and perhaps not science at all.

So, if the education system at Berkeley failed in my case, it’s not because I’m too stupid to grasp the difference between naïve falsification and no falsification. Something else must be wrong with me.

(d) Leaving the True Path

Reviewer Scott indicates that she, like Martin, found many factual statements in my book largely correct. She writes: “Individual sentences in Icons are usually technically correct, but they are artfully strung together to take the reader off the path of real evolutionary biology and into a thicket of misunderstanding.” (Scott, p. 2258)

So I’m not ignorant, because my statements are technically correct; and I’m not stupid, because my arguments are artful rather than illogical. The bottom line is that I take readers off the True Path. But if I don’t do this out of ignorance or stupidity, then I must be doing it out of wickedness.

## **WELLS IS WICKED**

Wickedness implies evil motivations, harmful actions, and moral corruption. My critics charge me with all three.

### **(a) Evil motivations?**

Reviewers Coyne, Pigliucci, Ussery, Raff, Padian and Gishlick all make a point of mentioning a statement I made in 1994 (available on the internet) that my studies and prayers years earlier had “convinced me that I should devote my life to destroying Darwinism.” [25] (Coyne actually begins and ends with this point, devoting about a quarter of his review to it.)

In my 1994 statement, I criticized Darwinism for claiming “that living things originated without God’s purposeful, creative activity.” It is no secret that Darwinism has such implications. As Oxford University’s Richard Dawkins wrote in 1986, “Darwin made it possible to be an intellectually fulfilled atheist.” And as Tufts University’s Daniel Dennett wrote in 1995, Darwin’s theory is a “universal acid” that corrodes “the fabric of our most fundamental beliefs”--especially belief in God. [26]

As a theology graduate student in the late 1970s and early 1980s, I learned that the anti-religious implications of Darwinism have profoundly influenced modern theologians. Even with only an undergraduate background in science, however, I knew that the evidence for Darwinism was not as solid as the theologians seemed to think. If Darwinism were solid science, its anti-religious implications would (in my opinion) be inescapable. The more I learned, however, the more it seemed to me that Darwinism was just old-fashioned materialistic philosophy masquerading as modern empirical science. Because of its profound and harmful consequences for religion, science and culture, I decided to devote my life to criticizing this philosophy and destroying its domination of our educational system.

That was, and still is, my motivation. I have never concealed it.

The question is: How relevant is my motivation? A zealous prosecutor may be committed to bringing down organized crime, but his commitment may be motivated by any number of things--such as a righteous devotion to justice, or a self-serving desire for personal advancement. Once he’s in the courtroom, however, the only thing that really matters is the evidence. The mob’s lawyers can attack the prosecutor’s motivations all they want, but if they can’t refute his facts, their clients may be convicted. In science, too, what matters is the evidence.

Darwinism's defenders often claim that nothing in biology makes sense except in the light of evolution. But this is like a defense attorney telling a jury that nothing makes sense except in the light of his arguments. Ultimately, the jury must reach their verdict on the basis of the facts before them. So it is in science. Nothing in biology makes sense except in the light of evidence. That is why the icons of evolution are so vigorously defended--even to the point of attacking my motivations.

(b) Harmful actions?

Among other things, my critics charge me with advocating censorship. Defenders of Darwinism often invoke the "Scopes trial" stereotype, according to which religious fundamentalists try to outlaw the teaching of evolution as they did in Tennessee in the 1920s.

Thus reviewer Martin claims that I am "crusading to take the teaching of evolution out of schools." (Martin, pp. 241-242) Reviewer Coyne accuses me of "conspiring to purge evolution from American education." (Coyne, p. 746) And reviewer Raff writes that my book "has already generated at least one state legislative bill and a number of law suits by parents to ban textbooks that present the supposed false icons." (Raff, p. 374)

But I have never advocated the removal of evolution from the biology curriculum. Although I am certainly in favor of revising textbooks that misrepresent the truth, I actually want students to learn more about evolution than Darwinists would like them to know--especially the arguments and evidence against it. It is not I but the Darwinists who tend to be censors, opposing efforts to teach students any criticisms of their theory.

One egregious example of Darwinian censorship occurred in 2000 and 2001 in Burlington, Washington. High school biology teacher Roger DeHart tried to supplement his biology textbook with articles critical of Haeckel's embryos and peppered moths from mainstream science publications such as *The American Biology Teacher*, *Natural History*, *The Scientist*, and *Nature*. The American Civil Liberties Union issued veiled threats of legal action, and the National Center for Science Education, a pro-Darwin advocacy group with which reviewers Scott, Padian and Gishlick are all affiliated, insisted that DeHart teach only orthodox Darwinism. Bowing to the intimidation, the superintendent of DeHart's school district prohibited him from distributing the articles--or even talking about them! DeHart was subsequently removed from his biology teaching position. (This shameful episode is documented in a new film, "Icons of Evolution," based partly on my book. [27])

Because of the Darwinists' vigorous efforts to oppose teaching students about the falsehoods in biology textbooks, an appendix in my book includes some sample warning labels that can be affixed to textbook figures to correct the problems. [28]

Padian and Gishlick consider this a harmful action, and write: "The thought that anyone would encourage others to deface textbooks for ideological reasons is chilling." (Padian & Gishlick, p. 36)

Yet my appendix specifically cautions readers that warning labels "should be applied only by, or under the direction of, the owner of the book." In other words, a school district may use the labels on their books, but students should not use them to deface school property. Perhaps Padian and Gishlick regard any effort to correct textbook misrepresentations--even by the book's owner--as "chilling."

Finally, I am criticized for advocating harmful political action. Raff writes: “Wells makes an explicit call for political action, quite correctly pointing out to the reader that tax dollars pay for most of the research done by Darwinists in America.” (Raff, p. 374) And Padian and Gishlick note disapprovingly that “Wells concludes with an exhortation to activism, including organizing Congressional hearings to stop ‘supporting dogmatic Darwinists that misrepresent the truth to keep themselves in power’ (p 242). Is this really about science or politics?” (Padian & Gishlick, p. 36)

But if “tax dollars pay for most of the research done by Darwinists in America,” then science and politics are already linked. Indeed, as a biologist myself, I periodically receive newsletters from scientific organizations boasting about their Capitol Hill lobbying efforts, which generate hundreds of millions of dollars every year. [29]

Now, I’m not opposed to public funding for scientific research. I wrote in my book: “Research—even research on evolution—is not a bad thing. But as we saw in several of the icons of evolution, data are frequently claimed to support evolutionary theory even when they contradict it.” Research is good, but misrepresenting the evidence to prop up Darwinian theory—or any other theory—is bad, and the public should not be forced to pay for it. I concluded, in accordance with ethical standards already used in the scientific community: “Scientists who deliberately distort the evidence should be disqualified from receiving public funds.” (pp. 241, 243)

In addition to supporting Darwinian research, taxpayers also support state universities and public school systems where their children are being fed misinformation about the evidence for evolution. Indeed, four of my reviewers (Martin, Pigliucci, Raff, and Padian) are professors at state universities, where salaries and benefits are derived from tax revenues. As a taxpayer myself, I think it is legitimate for citizens to inquire how their money is being used.

So, am I wicked? If it is harmful to oppose censorship in science education, and to correct misrepresentations in biology textbooks, then I am a wicked man. If it is harmful to demand truthfulness in publicly supported research and teaching, then I am a wicked man.

Let the jury decide.

(c) Moral corruption?

All my critics season their reviews to varying degrees with attacks on my character. At the high end of the ad hominem scale is Martin, who despite our disagreements treats me with relative decency. At the bottom of the scale are Padian and Gishlick.

The title of Padian and Gishlick’s review (“The Talented Mr. Wells”) is taken from a 1999 film. The review begins: “When we first meet the protagonist of the film *The Talented Mr. Ripley*, he is playing piano at a rooftop party in New York City. As the song finishes, an older man approaches and, observing Ripley’s Princeton blazer, remarks that Ripley must have been at school with his son, Dickie. Sensing an opportunity, Ripley does not mention that the blazer is borrowed from another guest, nor that he did not attend Princeton, but only worked there. He merely asks, ‘how is Dickie?’ This kind of distortion, misleading by the omission of important information, is the basis of *Icons of Evolution*. Its author, Jonathan Wells, appears to come from an unusually strong academic background, but the truth is more complex.” (Padian & Gishlick, pp. 33-34)



Throughout their review, Padian and Gishlick repeatedly compare me to Ripley. But Ripley isn't just a social climber who tells little white lies to get ahead. In the course of the film he commits all kinds of evil, including murder. In other words, he is a sociopath.

A sociopath. Now that's moral corruption! Wells "appears" to have earned Ph.D.s from Yale and Berkeley, but the "more complex" truth is that he is no better than a lying, murderous sociopath. If Padian and Gishlick are right, I shouldn't just be stripped of my academic credentials--I should be arrested.

But wait. On what grounds do they justify comparing me to a sociopath? First they quote my 1994 statement about devoting my life to destroying Darwinism (discussed above), and then they write that after obtaining a Berkeley Ph.D. in molecular and cell biology Wells "followed this with a 5-year postdoctoral position sponsored by a retired professor in the same department at Berkeley, during which time he seems to have performed no experiments.... No peer-reviewed publications resulted from Wells's 5-year stint." (Padian & Gishlick, p. 34)

These statements are false. To correct them, one of the Berkeley biologists with whom I allegedly "performed no experiments" and with whom I allegedly produced "no peer-reviewed publications" sent the following letter to The Quarterly Review of Biology:

May 2, 2002

The Editors  
The Quarterly Review of Biology  
110 Life Sciences Library  
State University of New York  
Stony Brook, NY 11794-5275

Dear Editors:

A book review published in your March, 2002, issue contains some factual errors that should be corrected.

In "The Talented Mr. Wells," Kevin Padian and Alan Gishlick compared Dr. Jonathan Wells to a movie character who impersonates a Princeton graduate, implying that Dr. Wells misrepresents his academic qualifications. Padian and Gishlick go on to claim that while Dr. Wells was a post-doctoral researcher at the University of California at Berkeley "he seems to have performed no experiments" and that "no peer-reviewed publications resulted from Wells's 5-year stint."

Both of these claims are false. Dr. Wells and I performed numerous experiments together in my laboratory at Berkeley while he was a post-doc. That research resulted in two peer-reviewed papers to which we contributed as co-authors. [A] Some of our work has even appeared in a textbook on developmental biology. [B]

I am surprised that The Quarterly Review of Biology would publish something with so little regard for truthfulness and professional decorum. The false claims of Padian and Gishlick unjustly damage not only the reputation of Dr. Wells, but also--indirectly--the reputations of those who worked with him. It seems to me that a retraction is in order.

Sincerely,

Carolyn A. Larabell, Ph.D.

Associate Professor  
Lawrence Berkeley Laboratory  
Berkeley, CA 94720

and

Associate Professor  
University of California, San Francisco  
San Francisco, CA 94143

cc: Professor Kevin Padian  
Mr. Alan D. Gishlick

[A] "Confocal Microscopy Analysis of Living *Xenopus* Eggs and the Mechanism of Cortical Rotation," *Development* 122 (April, 1996): 1281-1289; "Microtubule-mediated organelle transport and localization of beta-catenin to the future dorsal side of *Xenopus* eggs," *Proceedings of the National Academy of Sciences USA* 94 (February, 1997): 1224-1229.

[B] Klaus Kalthoff, *Analysis of Biological Development*, Second Edition (Boston: McGraw Hill, 2001), pp. 208-209. [30]

Since Padian is a Berkeley biology professor, he could easily have checked the facts about my Berkeley post-doc before publishing his false and defamatory statements. Maybe he did not bother to check carefully, or maybe he chose to lie. Maybe he was negligent, or maybe he was malicious.

Personal attacks on me, however, merely expose the scientific and moral bankruptcy of Darwinism. If Darwinists could show that my criticisms of the icons of evolution were unwarranted, or if they would stop trying lamely to defend the icons and simply replace them with better evidence, I would drop my case. But Darwinists cannot defend the icons, and they cannot afford to abandon them, so they resort to insults and smears. Is this how science is supposed to work?

### **TO BELIEVE, OR DISBELIEVE?**

I believe in Darwinian evolution as the natural counterpart of domestic breeding--that is, as an explanation for limited changes within existing species. I confess, however, that I do not believe in Darwinian evolution as a general explanation for the origin and diversification of all living things.

If my disbelief is due to ignorance, it's only because I did not learn an "investigative tradition" that manipulates statistics to prove something that is clearly false. And if my disbelief is due to stupidity, it's only because I do not grasp the "evidential value" of using evolutionary theory to explain away evidence that doesn't support it.

So, am I wicked? If Darwinian evolution (as a general explanation for the origin and diversification of all living things) were true, then maybe it would be wicked of me to reject it. But how can we know whether Darwinian evolution is true? In science, the truth or falsity of a theory is ultimately determined by comparing it with the evidence--not by affirming the theory in spite of the evidence, and not by attacking people who dare to doubt it.

The case is now before the jury. The jury includes honest, hard-working scientists who imbibed evolution from their textbooks but who haven't thought much about it since, because it's irrelevant to their research. The jury includes the roughly 90% of Americans who don't believe in Darwinism but who are forced to pay for its domination of our educational system anyway. And--most importantly--the jury includes students, the vast majority of whom (according to the polls) want to hear both sides of the growing controversy over Darwin's theory. The jury may be swayed for a while by prejudiced reviews published in prestigious science journals, or by increasingly ugly attempts at character assassination. Ultimately, however, the jury will decide the case based on the scientific evidence.

After all, nothing in biology--not even evolution!--makes sense except in the light of evidence.

## NOTES

[1] Richard Dawkins, "Put Your Money on Evolution," *The New York Times* (April 9, 1989), section VII, p. 35.

[2] On the probable composition of the Earth's early atmosphere, see Heinrich D. Holland, "Model for the Evolution of the Earth's Atmosphere," pp. 447-477 in A. E. J. Engel, Harold L. James & B. F. Leonard (editors), *Petrologic Studies: A Volume in Honor of A. F. Buddington* (Geological Society of America, 1962); Philip H. Abelson, "Chemical Events on the Primitive Earth," *Proceedings of the National Academy of Sciences USA* 55 (1966): 1365-1372; Marcel Florkin, "Ideas and Experiments in the Field of Prebiological Chemical Evolution," *Comprehensive Biochemistry* 29B (1975): 231-260; Sidney W. Fox & Klaus Dose, *Molecular Evolution and the Origin of Life*, Revised Edition (New York: Marcel Dekker, 1977).

[3] On the inability of a Miller-Urey-type experiment to produce amino acids under realistic early Earth conditions, see Sidney W. Fox & Klaus Dose, *Molecular Evolution and the Origin of Life*, pp. 43, 74-76; Heinrich D. Holland, *The Chemical Evolution of the Atmosphere and Oceans* (Princeton: Princeton University Press, 1984), pp. 99-100; Gordon Schlesinger & Stanley L. Miller, "Prebiotic Synthesis in Atmospheres Containing CH<sub>4</sub>, CO, and CO<sub>2</sub>: I. Amino Acids," *Journal of Molecular Evolution* 19 (1983): 376-382, p. 376. See also John Horgan, "In the Beginning....," *Scientific American* (February, 1991): 116-126, p. 121.

[4] Similarly, Mader's *Biology*, Starr and Taggart's *Biology: The Unity and Diversity of Life*, Schraer and Stoltze's *Biology: The Study of Life*, Guttman's *Biology*, Audesirk, Audesirk and Byers's *Life On Earth*, and Purves, Sadava, Orians and Heller's *Life: The Science of Biology* all feature the Miller-Urey experiment in their sections dealing with evolution. Alberts, Bray, Lewis, Raff, Roberts and Watson's upper-division textbook for biology majors, *Molecular Biology of the Cell*, discusses it in a chapter titled "Evolution of the Cell." The relevant page numbers in the cited textbooks are: Campbell, Reece and Mitchell's *Biology* (5th Edition, 1999), p. 494; Mader's *Biology* (6th Edition, 1998), p. 325; Starr and Taggart's *Biology: The*

Unity and Diversity of Life (8th Edition, 1998), p. 335; Schraer and Stoltze's Biology: The Study of Life (7th Edition, 1999), pp. 590-591; Guttman's Biology (1999), p. 603; Audesirk, Audesirk and Byers's Life On Earth (2nd Edition, 2000), p. 271; Purves, Sadava, Orians and Heller's Life: The Science of Biology (6th Edition, 2001), p. 451; Alberts, Bray, Lewis, Raff, Roberts and Watson's Molecular Biology of the Cell (3rd Edition, 1994), p. 4; Futuyma's Evolutionary Biology (3rd Edition, 1998), p. 167; Freeman and Herron's Evolutionary Analysis (2nd Edition, 2001), p. 481.

[5] The controversy over oxygen levels on the early Earth continues. See Nicolas J. Beukes, Herman Dorland, Jens Gutzmer, Munetomo Nedachi, & Hiroshi Ohmoto, "Tropical laterites, life on land, and the history of atmospheric oxygen in the Paleoproterozoic." *Geology* 30 (2002): 491-494.

[6] The article cited by Padian and Gishlick that contains a secondhand reference to work on the effect of oxygen in Miller-Urey-type syntheses is B. M. Rode, "Peptides and the Origin of Life," *Peptides* 20 (1999): 773-786. The secondhand reference in Rode's article is to F. Hanic & M. Morvova, Eleventh symposium on elementary processes and chemical reactions in low temperature plasmas. Low Tatras, Slovakia, 1998.

[7] On the reality and abruptness of the Cambrian explosion, see James W. Valentine, Stanley M. Awramik, Philip W. Signor and Peter M. Sadler, "The Biological Explosion at the Precambrian-Cambrian Boundary," *Evolutionary Biology* 25 (1991): 279-356; Jeffrey S. Levinton, "The Big Bang of Animal Evolution," *Scientific American* 267 (November, 1992): 84-91. See also Stephen Jay Gould, *Wonderful Life* (New York: W. W. Norton, 1989); Simon Conway Morris, *The Crucible of Creation* (Oxford: Oxford University Press, 1998); J. Madeleine Nash, "When Life Exploded," *Time* (December 4, 1995): 66-74. Charles Darwin acknowledged the difficulty this posed for his theory in *The Origin of Species*, Chapter X.

[8] On the "lawn" analogy for the Cambrian explosion, see Jeffrey S. Levinton, "The Big Bang of Animal Evolution," *Scientific American* 267 (November 1992): 88; Simon Conway Morris, *The Crucible of Creation* (Oxford: Oxford University Press, 1998), p. 176.

[9] Charles Darwin, *The Origin of Species*, Chapter XIV; *The Descent of Man*, Chapter I. The quotation calling embryology "by far the strongest" evidence is from a September 10, 1860, letter to Asa Gray, in Francis Darwin (editor), *The Life and Letters of Charles Darwin* (New York: D. Appleton & Company, 1896), Vol. II, p. 131; the letter is cited in Ernst Mayr, *The Growth of Biological Thought* (Cambridge, MA: Harvard University Press, 1982), p. 470, and in Stephen Jay Gould, *Ontogeny and Phylogeny* (Cambridge, MA: Harvard University Press, 1977), p. 70.

[10] Adam Sedwick, "On the Law of Development commonly known as von Baer's Law; and on the Significance of Ancestral Rudiments in Embryonic Development," *Quarterly Journal of Microscopical Science* 36 (1894): 35-52.

[11] William W. Ballard, "Problems of gastrulation: real and verbal," *BioScience* 26 (1976): 36-39, p. 38; Richard P. Elinson, "Change in developmental patterns: embryos of amphibians with large eggs," pp. 1-21 in R. A. Raff & E. C. Raff (editors), *Development as an Evolutionary Process*, vol. 8 (New York: Alan R. Liss, 1987), p. 3. See also Jonathan Wells, "Haeckel's Embryos and Evolution: Setting the Record Straight," *The American Biology Teacher* 61 (1999): 345-349.

[12] Jerry Coyne, "Not black and white," a review of Michael Majerus's *Melanism: Evolution in Action*, *Nature* 396 (1998): 35-36. See also Jonathan Wells, "Second Thoughts about Peppered Moths," *The Scientist* (May 24, 1999): 13.

[13] Kauri Mikkola, "On the selective forces acting in the industrial melanism of *Biston* and *Oligia* moths (Lepidoptera: Geometridae and Noctuidae)," *Biological Journal of the Linnean Society* 21 (1984): 409-421, p. 416; Rory J. Howlett and Michael E. N. Majerus, "The understanding of industrial melanism in the peppered moth *Biston betularia* (Lepidoptera: Geometridae)," *Biological Journal of the Linnean Society* 30 (1987): 31-44, p. 40. See also Tony G. Liebert and Paul M. Brakefield, "Behavioural studies on the peppered moth *Biston betularia* and a discussion of the role of pollution and lichens in industrial melanism," *Biological Journal of the Linnean Society* 31 (1987): 129-150, p. 145.

[14] M. E. N. Majerus, *Melanism: Evolution in Action* (Oxford: Oxford University Press, 1998), Table 6.1, p. 123.

[15] R. C. Steward, "Industrial and non-industrial melanism in the peppered moth, *Biston betularia*," *Ecological Entomology* 2 (1977): 231-243, p. 236; Majerus, *Melanism: Evolution in Action*, p. 121. For an excellent new book on this subject see Judith Hooper, *Of Moths and Men: Intrigue, Tragedy & the Peppered Moth* (London: Fourth Estate, 2002).

[16] On what it takes to produce four-winged fruit flies, see E. B. Lewis, "A gene complex controlling segmentation in *Drosophila*," *Nature* 276 (1978): 565-570; E. B. Lewis, "Control of Body Segment Differentiation in *Drosophila* by the Bithorax Gene Complex," pp. 269-288 in Max M. Burger & Rudolf Weber (editors), *Embryonic Development, Part A: Genetic Aspects* (New York, Alan R. Liss, 1982); E. B. Lewis, "Regulation of the Genes of the Bithorax Complex in *Drosophila*," *Cold Spring Harbor Symposia on Quantitative Biology* 50 (1985): 155-164. On the absence of flight muscles in the extra pair of wings, see J. Fernandes, S. E. Celniker, E. B. Lewis & K. VijayRaghavan, "Muscle development in the four-winged *Drosophila* and the role of the Ultrabithorax gene," *Current Biology* 4 (1994): 957-964; Sudipto Roy, L. S. Shashidhara & K. VijayRaghavan, "Muscles in the *Drosophila* second thoracic segment are patterned independently of autonomous homeotic gene function," *Current Biology* 7 (1997): 222-227.

[17] On saturation mutagenesis in fruit flies, see Christiane Nüsslein-Volhard & Eric Wieschaus, "Mutations affecting segment number and polarity in *Drosophila*," *Nature* 287 (1980): 795-801; Daniel St. Johnston & Christiane Nüsslein-Volhard, "The Origin of Pattern and Polarity in the *Drosophila* Embryo," *Cell* 68 (1992): 201-219. Saturation mutagenesis has also been used in zebrafish; see Peter Aldhous, "'Saturation screen' lets zebrafish show their stripes," *Nature* 404 (2000): 910; Gretchen Vogel, "Zebrafish Earns Its Stripes in Genetic Screens," *Science* 288 (2000): 1160-1161.

[18] Henry Gee, *In Search of Deep Time: Beyond the Fossil Record to a New History of Life* (New York: The Free Press, 1999), pp. 23, 116-117.

[19] Tim M. Berra, *Evolution and the Myth of Creationism* (Stanford: Stanford University Press, 1990), p. 117.

[20] This problem has long been familiar to paleontologists concerned with the relationship between theory and evidence. In 1974, for instance, David Kitts observed that "the claim is

made that paleontology provides a direct way to get at the major events of organic history and that, furthermore, it provides a means of testing evolutionary theories. This claim raises the critical question of how close we can get to evolution without presupposing some causal theory of descent. ... [T]he paleontologist can provide knowledge that cannot be provided by biological principles alone. But he cannot provide us with evolution.” (D.B. Kitts, “Paleontology and Evolutionary Theory,” *Evolution* 28 [1974]: 458-472, p. 466) In 1982, Keith Thomson noted: “Although ‘finding ancestors’ is the traditional paleontologists’ ‘proof,’ such ‘historical events’ cannot be tested by assembling nice series of fossils without discontinuities, because the evolutionary hypothesis is superficially so powerful that any reasonably graded series of forms can be thought to have legitimacy. In fact, there is circularity in the approach that first assumes some sort of evolutionary relatedness and then assembles a pattern of relations from which to argue that relatedness must be true.” (K. S. Thomson, “The meanings of evolution,” *American Scientist* 70 [1982]: 529-531, pp. 529-530) [I am indebted to Paul Nelson for providing these references.--JW]

[21] Many biology textbooks define homology as similarity due to common ancestry, yet claim that it is evidence for common ancestry. For example, Starr and Taggart’s *Biology: The Unity and Diversity of Life* (8th Edition, 1998) states that the “pattern of macroevolution--that is, change from the form of a common ancestor--is called morphological divergence.... Homology [is] a similarity in one or more body parts in different organisms that share a common ancestor.... Homologous structures provide very strong evidence of morphological divergence.” (pp. 318-319) In a section on “The Evidence for Evolution” in the teacher’s edition of Johnson’s *Biology: Visualizing Life* (1998), students are told that “homologous structures are structures that share a common ancestor,” and an accompanying note tells the teacher that “such structures point to a common ancestry.” (p. 178) According to Campbell, Reece and Mitchell’s *Biology* (5th Edition, 1999), “similarity in characteristics resulting from common ancestry is known as homology, and such anatomical signs of evolution are called homologous structures. Comparative anatomy is consistent with all other evidence in testifying [to] evolution.” (p. 424) Raven and Johnson’s *Biology* (5th Edition, 1999), in a section titled “The evidence for macroevolution is extensive,” includes the following: “Homology: Many organisms exhibit organs that are similar in structure to those in a recent common ancestor. This is evidence of evolutionary relatedness.” A few pages later, the same textbook explicitly defines homologous structures as “structures with different appearances and functions that all derived from the same body part in a common ancestor.” (pp. 412, 416) Audesirk, Audesirk and Byers’s *Life On Earth* (2nd Edition, 2000) calls homology “evidence of relatedness” in a section titled “Comparative Anatomy Provides Structural Evidence of Evolution.” The textbook tells students: “Internally similar structures are called homologous structures, meaning that they have the same evolutionary origin despite possible differences in function. Studies of comparative anatomy have long been used to determine the relationships among organisms, on the grounds that the more similar the internal structures of two species, the more closely related the species must be, that is, the more recently they must have diverged from a common ancestor.” (p. 236)

[22] John L. Hubisz, “Review of Middle School Physical Science Texts,” Physical Sciences Resource Center (November 1, 2000), p. 55; available at <http://www.psrc-online.org/curriculum/book.html>.

[23] Michael Lynch, “The Age and Relationships of the Major Animal Phyla,” *Evolution* 53 (1999): 319-325, p. 323.

[24] Alan H. Linton, emeritus professor of bacteriology, University of Bristol (U.K.), in The Times Higher Education Supplement (April 20, 2001), p. 29.

[25] The listed reviewers mention my 1994 statement on the following pages of their reviews: Coyne, p. 745; Pigliucci, p. 414; Ussery, p. 73; Raff, p. 374; Padian & Gishlick, p. 34. The statement can be found at

<http://www.tparents.org/Library/Unification/Talks/Wells/DARWIN.htm>

[26] Richard Dawkins, *The Blind Watchmaker* (New York: W. W. Norton, 1986), p. 6; Daniel C. Dennett, *Darwin's Dangerous Idea* (New York: Simon & Schuster, 1995), pp. 18, 63, 520-521.

[27] "Icons of Evolution," (2002). Available from ColdWater Media (Monument, CO), 1-800-889-8670.

[28] The warning labels and various other materials are also available on my web site, <http://www.iconsofevolution.com>.

[29] The Federation of American Societies for Experimental Biology puts out a bimonthly "FASEB NEWS," which focuses primarily on funding issues and lobbying efforts. The American Society for Cell Biology puts out a monthly "ASCB Newsletter," which includes a public policy briefing that deals mainly with lobbying efforts. In August 1999 and March 2002, the ASCB sent letters to officials in Kansas and Ohio, respectively, urging that these states resist efforts to include alternatives to Darwinian evolution in their science teaching standards.

[30] Professor Larabell's letter is included here with her permission. Lest Padian now unleash his fury on her, I hasten to point out that she is not responsible for my heretical views on Darwinism. On May 20, 2002, *The Quarterly Review*

File Date: 06.17.02

Journal of American History March, 2001

## **Evolution for John Doe: Pictures, the Public, and the Scopes Trial Debate**

**Constance Areson Clark**

According to Joseph Wood Krutch, the most dramatic event at the Scopes trial of 1925 occurred when William Jennings Bryan announced, incredibly, that he was not a mammal. Looking back from the 1960s, Krutch, who had covered the trial for the *Nation*, remembered the moment with amusement. H. L. Mencken, Krutch noted, had made a point of falling noisily from a table, as if to punctuate the absurdity of Bryan's statement.<sup>1</sup> The trial transcript shows that Bryan did not precisely deny his place within the zoological class Mammalia. He did, however, emphatically object to a diagram that located humans among the mammals or, as he put it, in "a little ring . . . with lions and tigers and everything that is bad!" (See figure 1.) The diagrammatic balloon that so offended Bryan came from a discussion of evolution in

George William Hunter's *Civic Biology*, the textbook assigned to John Thomas Scopes's biology class. Bryan responded viscerally to the image.<sup>2</sup>

Bryan had a point. Although he never really understood evolution, he had an eye for ambiguity in evolutionary metaphors. Like many diagrams published by scientists and science popularizers of the time, Hunter's balloons could be interpreted as undermining common written and spoken defenses of evolutionary theory, defenses made vulnerable by the claims scientists made, the disarray of evolutionary theory in the 1920s, and a disjunction between public and scientific understandings of scientific illustration. Visual images played an important part in the public discourse associated with the Scopes trial, but they did not necessarily convey the messages their authors intended.

The antievolution campaign of the 1920s caught many people by surprise. In the late nineteenth century American biologists had assimilated various forms of evolutionism. By the early twentieth century, most scientists thought that any tension between evolutionism and religion had long since been resolved. But the issue resurfaced in the early 1920s; the Scopes trial of 1925 was the most conspicuous moment in a longer public debate about evolution.

The Scopes trial seems firmly lodged in American mythology, portrayed sometimes as circus, sometimes as tragedy, and often as farce. Frederick Lewis Allen's durable *Only Yesterday* relegated the trial to a chapter on the ballyhoo of the decade; later writers fell in with Mencken's dismissal of Bryan and other antievolutionists as anti-intellectual religious zealots, the yokels of small-town America. Many people know the trial through the movie *Inherit the Wind*; but that movie is more an allegory of the McCarthy era than a work of history, portraying antievolutionists as a mob representing the repressive potential of the emotional masses. In recent years historians have corrected the mythology. Lawrence W. Levine and Garry Wills have shown that Bryan raised serious issues in the evolution debates, including concerns about social Darwinism and about the implications for democracy of the growth of scientific and technical expertise. Edward Larson, Ronald Numbers, and Paul K. Conkin have demonstrated that the creation/evolution debates of the 1920s had roots in a theological rift within American Protestantism and have explored antievolutionists' fears about the disruptive potential of what they called materialism. Indeed, though in the 1920s many people retained the Progressive Era faith in science, others began to suspect that science could be one of the more corrosive of the "acids of modernity." The debates culminating in the trial were not just about science. People who wrote and talked about evolution linked it to many other things: the role of science during the Great War; a cultural rift between rural and urban populations; the democratization of educational opportunities; sweeping demographic changes accelerated by the war; debates about race and immigration; and a growing discussion of the difficult balance between majoritarianism and individual civil liberties.<sup>3</sup>

Scientists themselves grappled with general cultural change, the unsettled state of evolutionary theory, and the challenge of new roles. In the 1920s, when their assimilation of Charles Darwin's theory of natural selection remained incomplete and tentative, biologists labored to assure the public both that the foundation of evolutionary theory was secure and that evolution was compatible with religion. The difficulties of the task were exacerbated by scientists' involvement in the larger debates, and their scientific pronouncements were not easily separated from their extrascientific concerns.

Historians have not yet explored the reciprocal influences of science and larger cultural issues in this debate. This article begins to probe the nature of this relationship by focusing, not on



the trial itself, but on the role of visual images of evolutionary ideas published during the debate. My intention is not to analyze public reaction, but to examine the ideas available to the public in symbolic form and to compare visual representations of scientific ideas with the messages scientists sought to convey in words. On a general level, I want to suggest that we cannot understand the complex relationship of science and its larger public if we look at words alone. Historians and historians of science have begun in the last twenty-five years to devise creative ways to analyze visual culture.<sup>4</sup> Because of the power of visual representations of scientific ideas, attention to visual symbols can enhance our analysis of the circulation of scientific themes in American culture.

In particular, during the debates of the 1920s, the words published by scientists and science popularizers were often at odds with the messages implied in the illustrations that accompanied those words. This was so for two reasons. First, scientists, more than scholars in other disciplines, use diagrams and visual images not only to communicate their ideas but also to form them. Building on the insights of Martin J. S. Rudwick, historians of science have shown that for scientists diagrams are not simply decorations, but elements in a visual language with its own grammar and tacitly understood conventions. Scientists develop visual lexicons, sets of motifs that stand for ideas and assumptions familiar among colleagues. Scientists formed a community that increasingly spoke a private language, and even the pictures they drew contained specialized professional vocabularies. Outsiders might well have misunderstood.<sup>5</sup>

Second, nonscientists who misinterpreted the intended messages of scientific diagrams were not always entirely mistaken. Creative misreadings can tell us a good deal. Scientific images sometimes reveal extrascientific concerns on the part of scientists--assumptions, biases, or predilections of which they may be unaware, but that may strike a chord with lay observers. In the 1920s, scientific diagrams reflected ambivalences in the thinking of some evolutionists, sources of potentially confusing mixed messages. Biologists did not agree on the mechanisms of evolution, the proper role of scientists in public controversy, or even the boundaries of science. Cultural preoccupations infused the conflicts among scientists. Questions about the mechanism of evolution, for example, were linked to concerns about determinism and human will. And the image of evolution as a neat, frictionless progress toward a goal in which inferior forms yielded to superior ones reinforced beliefs that differences among humans--notably race--showed some as inferior to others. Conscious of occupying a position of cultural prestige, some scientists felt compelled to take public stances in the evolution debates, and they did so actively. The visual images they published often made the extrascientific concerns and ambiguities in their thinking strikingly evident.

For scientists in 1925, the Civic Biology diagram that troubled Bryan fit an established set of visual conventions. Humans held no special place; they resided within the rather small circle allotted to the mammals. That circle was small because the number of species in the class of mammals is small relative to the number in other zoological classes. Scientists familiar with such diagrams understood the chart to describe taxonomic relationships, those of the scientific system for classifying living things; they also understood it to maintain silence on questions of religious or political significance. Bryan knew better. He recognized what the size of the circles was intended to represent, but he took the diagram as a whole to have a larger meaning. In his *Memoirs* he returned to this theme: "No circle is reserved for man alone. . . . What shall we say of the intelligence, not to say religion, of those who . . . put a man with an immortal soul in the same circle with the wolf, the hyena, and the skunk?"<sup>6</sup> For scientists this was a version of a familiar branching diagram depicting natural relationships. From Bryan's

point of view it seemed to mock traditional verities about human significance. It was the human place in nature that was at stake.

During the debates of the 1920s scientists came forward to champion evolution, the scientific method, and academic freedom--some believed they were protecting rationalism itself. Not all scientists participated in those debates. Some worried that involvement in such public controversies might compromise their credibility and even dignity as scientists. Those who did join the fray shared certain rhetorical themes, prominent among them an insistence that evolutionary thought did not threaten Christian values. Many of the scientists participating most vocally in the debate were devout Christians who had themselves wrestled with possible contradictions between their faith and their scientific practice.<sup>7</sup>

Perhaps the part of evolutionary theory scientists engaging in the public debate defended least adamantly was natural selection. The Scopes trial came along at an awkward moment for biological scientists. Evolutionary theory was under assault from the outside at a moment when it suffered internal disarray. Scientists affirmed the fact of evolution, but they remained collectively vexed as to the mechanism by which it occurred. The problem was not simply that biologists could not reach a consensus as to the efficacy of Darwinian natural selection but also that many of them clung to the distinctly un-Darwinian notion of purposive directing mechanisms--teleologies. Teleology appealed especially to those who attempted to combine their religious beliefs and their understanding of evolution--exactly the scientists most active in the Scopes trial debates and most often encountered in newspaper and magazine stories about evolution.<sup>8</sup>

One of the scientists most conspicuous in the newspapers was the paleontologist Henry Fairfield Osborn, the influential president of the American Museum of Natural History in New York. Because he occupied a prominent place in American science, because he was an energetic defender of evolutionary ideas during the Scopes trial debate, and because he was ardently involved in designing many of the most widely published visual representations of evolutionary ideas, his would be among the most frequently heard voices in the evolution debates of the 1920s. Osborn and his colleagues at the American Museum became outspoken proponents of evolution, debating Bryan and other antievolutionists frequently in the newspapers and on the radio. Their views on evolution did not always represent the profession as a whole, since there was no consensus; indeed, by the end of the decade they disagreed among themselves on essential points of evolutionary theory. Yet--in part because the museum supplied so many of the illustrations in books written for a popular audience--their ideas loomed large in the debate.<sup>9</sup>

In the year before the trial, Osborn had tangled with a prominent opponent of evolution over a visual representation of human evolution. In 1924 the Reverend John Roach Straton, the outspoken minister of Calvary Baptist Church in New York, gave a sermon that described his response to a sequence of skulls on display in the famed Hall of the Age of Man at the American Museum. Straton complained that the exhibit contradicted Osborn's statements about the nature of evolution. In a letter to Straton, Osborn had written that the Hall of the Age of Man "demonstrates very clearly not that man has descended from the monkeys or from the apes, but that he has a long and independent line of ascent of his own." Straton disagreed. "A casual glance naturally creates the impression," he complained, that the sequence of skulls from monkey to human forms a "sort of sliding scale." He expressed alarm about the effect on the many schoolchildren he had seen at the museum, worrying that "their wondering little eyes would gaze upon these gruesome bones, . . . and the children, with their

immature minds, looking first at the skull of the little monkey at one end of the line, and on up to the skull of a man of today, would inevitably conclude that one came out of the other." Straton's visit to the museum and his sermon were reported at length in newspapers around the country, and he continued to cite his visit to the museum in debates with evolutionists.<sup>10</sup>

Straton was not alone in finding Osborn's avowals about humans' "long independent line of ascent" unpersuasive when compared with museum displays. The New York Times published an account early in 1926 of an address to the Catholic Library Association titled "Ignorance and Evolution." The Times reported Monsignor Joseph H. McMahon's observation that "scientists do not assert dogmatically that man is descended from the ape, yet the average man is led so to believe by the exhibitions in our museums."<sup>11</sup> Many people visited the American Museum, but its influence extended far beyond New York, partly because of the interest Osborn and his colleagues took in designing exhibits and distributing images based on them. They used lantern slides extensively in public presentations, provided slides and pictures to teachers around the country, and supplied illustrations to writers of textbooks and popular books about science.

The evolution debates inspired a prolific group of science popularizers, advocates, and boosters. During the 1920s proselytizers for evolution offered the public many works belonging to the category of "outline of" books in vogue in the 1920s. Books on evolution for a lay audience were so numerous that for several weeks during the summer of the Scopes trial a Brentano's bookstore in New York devoted an entire window display to them. Reviewers commented regularly on the proliferation of popular explanations of evolution. Such books sold well enough that they continued to appear throughout the decade; a 1929 column in the *World's Work* called "Books for Babbitt" remarked on their continuing popularity, and several of them were on a list of best-selling books as late as 1929.<sup>12</sup>

The genre might be identified by the title of one of the more widely advertised of them, *Evolution for John Doe*, by Henshaw Ward. Ward, a teacher and textbook writer, asserted that

the average man . . . thinks evolution is 'the doctrine that man is descended from monkeys,' and he is so amused or offended at this theory that his whole mind is occupied with it. His conception is ridiculously false. Until John Doe discards that notion and takes a fresh start, he will never understand the subject.

Ward's solution to this misapprehension, to eliminate from his book any "attention to the 'monkey doctrine' [or] reference to any ape-like creature," was unusual. More often, scientists acknowledged the common ancestry of humans and apes but emphasized that there was no simple linear descent from monkey to human--that we did not, as the pundits would suggest, "have a monkey for a grandfather." The books implicitly addressed to Mr. Doe (and, presumably, his wife) adopted a variety of rhetorical strategies, but most of them attempted to reassure readers that, properly understood, evolution need not upset Christian views of the human place in nature.<sup>13</sup>

Many of these books shared illustrations, and the pictures the authors chose complicated the reassuring messages about the compatibility of evolution and religion that they put into words. Popularizers drew liberally from the visual repertoire of evolutionary biologists, especially those who designed museum displays, often for the American Museum of Natural History in New York. As Bryan and Straton understood, ideas about the human place in nature were implicit in images of evolution, whether or not such writers as Henshaw Ward chose to

acknowledge it. Paintings and sculptures of human ancestors evoked emotion on their own, and as Straton noted, the arrangement of such figures also carried messages. In particular, the sequence of skulls lambasted in his sermon was related to the tradition of evolutionary tree diagrams.

One convention of scientific illustration is the use of family trees to visualize natural relationships.<sup>14</sup> As the ancient concept of a *scala naturae*, or a linear and hierarchical chain of being, began to give way in the late eighteenth and early nineteenth centuries, it was increasingly supplanted in zoology by an image of the natural world as organized in a complex, branching pattern. When Darwin published *On the Origin of Species* in 1859, the evolutionary tree diagram he included was the only illustration in all 495 pages of the book. (See figure 2.) The historian Howard E. Gruber has argued convincingly that Darwin included this diagram because it played a crucial role in his thinking about evolution, beginning long before 1859. Darwin actually formulated his theory by devising and contemplating this mental picture of evolutionary patterns, according to Gruber.<sup>15</sup> Darwin's famous tree illustrates his understanding of the complexity, contingency, and fecundity of the evolutionary process. It is an abstract tree: It does not describe the fate of specific organisms or lineages; it describes a process. It indicates increasing diversity, without a single direction of growth. Darwin explicitly intended his tree to be nondirectional, not a literal tree with a main trunk and side branches, but a branching diagram.

The durable notion of a linear chain of being would not give way so easily, though. Trees that took themselves literally as trees rather than as branching diagrams grew out of a late-nineteenth-century tradition. The evolutionary tree motif became familiar to the American public through Ernst Haeckel's family tree diagrams. Haeckel's influential "Pedigree of Man" (figure 3.), widely published in the 1870s, was a prototype for later trees. Haeckel's tree was unusual, yet curiously representative of several underlying assumptions and conflicts in late-nineteenth-century biology. Most evolutionary diagrams of the time were simple line drawings; Haeckel's "pedigree" was drawn to look like a real (if somewhat misshapen) tree. But though it had branches, it revealed an essentially linear concept of evolution, and an undeniably hierarchical one. Its most obvious feature was that it culminated in "man," who resided not only at the summit of the tree but at the top of the main trunk, surrounded by the next "higher" animals, the other primates. Other kinds of animals occupied outlying branches, which were atrophied and unimpressive. They looked like evolutionary dead ends, not like growing branches. The categories were inconsistent: Closely related groups of mammals, such as rodents, and ecological types, such as "beasts of prey" and "beaked animals," that do not constitute related groups were both given branches. The top quarter of the tree was devoted to the mammals. Taxonomic categories were amplified toward the top of the tree, by implication magnifying the significance of the "higher orders." Lower orders, such as rodents, were confined to single branches--although they might include large numbers of species--while a subset of the primate order, the family of the apes, adorned the crown of the tree; the four genera of apes surrounded the single species "man," at the pinnacle. Though the diagram in some sense presented a branching concept of evolution--echinoderms, such as starfish, were not positioned as steps in the progression toward humans but as a side branch--in essence it retained the old concept of the chain of being, a main trunk progressing from monera to man. Furthermore, Haeckel's tree, unlike Darwin's branching diagram, conveyed no sense of time. It was static, apparently complete, including no labels or other conventions to indicate time's passage and no extinct animals. The appearance of the "lower" taxonomic groups on the tree's lower branches implied that those groups appeared on earth earlier. Starfish and monera continue to exist and to evolve, but Haeckel's diagram offered no way to show this. A position

near the bottom of the tree seemed to mean a low position in the hierarchy of nature more than an early appearance on earth.<sup>16</sup>

Trees such as Haeckel's caused a backlash among scientists. Some biologists rejected them, complaining that they were too speculative to be scientific. Osborn acknowledged this sentiment, but he did not share it. In a 1910 book aimed at a general audience, *The Age of Mammals in Europe, Asia, and North America*, he noted that evolutionary tree diagrams had "fallen into disfavor," yet, he suggested, "the present reaction against these trees does not seem to be altogether wise, for we must remember that they are among the working hypotheses of this science, which serve to express most clearly the author's meaning."<sup>17</sup> Osborn pioneered the creation of evolutionary diagrams incorporating ecological, historical, and morphological information and ideas about animals.

That diagrams functioned as "working hypotheses" was an astute observation, but when published or put on display in museums, diagrams conceived in a spirit of exploration and hypothesis testing could suggest a misleading certainty. Publication in popular books or museum display magnifies the influence and increases the longevity of such images. And whether the diagrams always "express most clearly the author's meaning" is problematic. In some cases the author's meaning would not be transparent without reference to the visual grammar of the scientific vernacular. In other cases the diagrams may have expressed their authors' ideas more clearly than they realized or may have reflected mixed feelings.

Many of the diagrams designed by Osborn and his colleagues at the American Museum of Natural History resembled Darwin's diagram in their bushiness, especially those illustrating the concept Osborn named "adaptive radiation," the diversification of related organisms as they adapt to different environments. Darwin's branching concept of evolution was not, however, the primary image offered to the public in diagrams of the 1920s. A characteristic example is the tree (figure 4.) in Benjamin C. Gruenberg's *The Story of Evolution*, a highly stylized, conventionalized rendering, including no information about time or extinction, conveying the impression that there is a single "main line" of evolution, culminating in "man" (in a suit!).<sup>18</sup>

Why were trees like this offered to the public in place of more complex and informative diagrams? Remnants of the underlying conception of evolution displayed by Haeckel's tree, so much at odds with Darwin's branching concept, remain in evidence in many images found in the popular literature of the 1920s, even some grounded in a relatively Darwinian view. Among the most frequently reprinted tree diagrams of the 1920s were illustrations of the evolutionary history of horses, especially those produced by the geologist William Diller Matthew, working under Osborn, for exhibit at the American Museum. Representations of the fossil record of horses had been favorite illustrations of evolution ever since Thomas Henry Huxley, touring the United States as Darwin's most famous public advocate, visited the fossil horse collection of Othniel Charles Marsh at Yale College in 1876. The Yale horses made such a convincing case for evolution that Huxley immediately included them in lectures during his American tour. The horse diagram most widely published in the 1920s (figure 5) was actually executed in 1902. At that time, horse evolution remained the most convincing instance of evolution, and the diagram creatively incorporated geologic strata, associating them with changes in parts of horse anatomy over time. The 1902 diagram was exhibited at the museum and published in successive museum leaflets. But by 1925 Matthew realized that horse evolution was much more complex than his own most famous diagrams might indicate. He had highlighted the net direction from *Eohippus* to *Equus* partly to demonstrate evolutionary

sequence. In the face of challenges to evolution in the 1920s, science popularizers used the diagram heuristically--to demonstrate the fact of evolution even though it simplified the pattern by emphasizing large trends and net direction and neglecting complexity and side branches. And museum display and publication fixed these images in a canon, obscuring their dynamic function as "working hypotheses."<sup>19</sup>

The construction of museum exhibits--which was expensive--extended the life span of Matthew's most linear horse images. The prominence of the American Museum exhibits meant that those diagrams were widely reproduced in books and magazines for John Doe. By 1930, they were also included in books for children, such as *The Earth for Sam*.<sup>20</sup> Matthew's familiar horse diagrams implied a linear, teleological evolutionary pattern that could readily be extrapolated to human evolution. And in 1925, evolution meant human evolution, books for John Doe notwithstanding. If horse evolution followed a linear trajectory, the obvious conclusion was to extrapolate and assume a linear ascent to the "highest" form of animal--humans.

The apparently linear views of human evolution in museum exhibits and in popular culture may have confirmed belief in a deterministic, progressive, teleological pattern of evolution--evolution with humans as its goal. In 1925 many of the scientists who sought to persuade the public of the harmony of evolution with the tenets of Christian faith perceived evolution as progressive in that sense. They did not, however, see evolution as a simple linear pattern; even committed believers in progress and direction in evolution knew that the patterns of evolution were complex.<sup>21</sup>

The impression of a linear ascent to humans was reinforced by another diagram frequently reproduced in the 1920s. (See figure 6.) Originally published by Thomas Henry Huxley in *Man's Place in Nature* in 1863, the sequence of skeletons of the four great apes--a gibbon, an orangutan, a chimpanzee, and a gorilla--and a human appeared amid the debates that followed publication of *On the Origin of Species*. In that context Huxley's primary concern, like Matthew's in 1902, was to establish relationship and thus the fact of evolution. In his debate with the anatomist Richard Owen over human origins, Huxley's strategy was to argue that anatomical similarities among the brains of primates implied a close relationship. Although he sought to establish the physical relationships of humans and the great apes, he conceded "the vastness of the gulf between civilized man and the brutes . . . whether from them or not, he is assuredly not of them."<sup>22</sup> Even so, his ape-to-human series implied equal distances separating the four great apes from each other and the fourth from the human. That would be the obvious inference when the sequence was removed from the anatomy lab and reproduced in popular books. And it was widely reproduced, beginning in the 1870s in successful books by Haeckel and continuing in the 1920s John Doe genre.

Scientists often cited the cultural distance between humans and apes; some of them prized that distance as much as Bryan did. But Huxley's diagram implied something different. Based on anatomical studies of extant species, the series included no reference to evolutionary time or ecological context, and the proximity of the human figure to the apes, along with the left-to-right direction from apes to human, would evoke familiar echoes of the old notion of a linear chain of being. From the perspective of those unfamiliar with its context, Huxley's ape-to-human series could imply that the distance separating the human from the gorilla was no greater than that between the gorilla and the chimpanzee. This visual series survived as a recurrent motif for the 1920s literature.

Huxley's diagram provided a template for a visual cliché--easily used in a standard evolution joke. This cliché appeared in press coverage of the Scopes trial in 1925. A cartoon in the *New Yorker* invoking it illustrates the cultural backdrop of the evolution debate. Called "The Rise and Fall of Man," the series progressed from chimpanzee to Neanderthal to Socrates, then--by implication, descended--to William Jennings Bryan. (See cover illustration.)<sup>23</sup> For the editors of such magazines as the *New Yorker*, the evolution debates were more about cultural issues than about the substance of science, and those magazines--and cartoons like this one--played an important role in keeping cultural conflict at the center of the debate. Such cartoons caricature evolution in order to make jokes about human culture. The joke may consist in the exposure of some human pretense in the face of our animal origin or highlight the peculiar status of humans as evolutionary anomalies. In general, though, the final figure supplies the punch line, diverting attention from the assumptions underlying the sequence, including the very notion that it is a sequence, marking progress from left to right, as in a language of words. The cliché became a kind of common knowledge. The common knowledge in this case included the linear, goal-directed version of evolution and human descent directly from apes, views that were far more controversial among scientists in 1925 than published diagrams revealed.

An evolutionary tree diagram by another American Museum paleontologist, William King Gregory, made explicit the dimension of geological time left out of the popular cliché. (See figure 7.) Most evolutionists understood this dimension to be implied in linear diagrams. The familiar sequence, appearing at the top of the tree, represented the living remnants of a long history, products of a more complex branching pattern. Gregory reversed the conventional left-to-right order by placing humans on the far left, perhaps intending to undermine the usual connotation of progress toward humans. His inclusion of "undiscovered ancestors" at the base of the diagram highlighted its function as "working hypothesis," which may explain why trees like this were not common in books for John Doe.<sup>24</sup>

In his writings Gregory suggested that earlier taxonomists, under the influence of the old chain-of-being model of linear evolution, had simplified evolutionary trends by assuming that animals evolve from simple to complex or generalized to specialized. In reality, he suggested, each species of animal is a mosaic of primitive and advanced characters. Furthermore, some features have greater diagnostic value for classification than others. Trained as a comparative anatomist, Gregory began with skeletons and reasoned backward through all of the forces that contribute to the forms that skeletons take: the constraints of physiology, development, genetics, and evolutionary history. His scientific work had a strong ecological bent. The animal we see in the modern world is the complex result of a subtle combination of ecological and historical forces. An evolutionary branch occurs under the influence of a particular set of ecological circumstances, and once taken, that branching is irrevocable. So the ecological history of an animal is a part of both its past and its future. Animals evolve in response to ecological circumstances, but they have to use the raw material their evolutionary history has given them.<sup>25</sup>

Seeing the living animal as a mosaic of adaptation to past as well as present ecological circumstances, Gregory designed family tree diagrams of individual animal features, for example, the primate hand or the mammal skull. A single animal might combine both primitive and advanced characteristics. In his diagrams of hands or skulls "from fish to man," Gregory intended the complexity of evolutionary processes to be assumed. In the heat of the Scopes trial debates, however, some of those diagrams were reprinted out of context,

conveying an impression that a single feature, the primate hand, for example, was responsible for an animal's relative success--denoted by its position on the family tree.

In claiming that tree diagrams "express most clearly the author's meaning," Osborn was both right and wrong. The function of the diagrams as working hypotheses of science was belied by their authority as truth and their longevity on display and in print. The effort to use them as persuasive devices obscured the syntax of scientific convention necessary to comprehend the full intentions of their authors. Extrascientific messages, intended or not, would often be more evident to audiences.

John Doe need not have been a creationist, an anti-intellectual, or a fool to react with discomfort to the hierarchical diagrams used by defenders of evolution. Several of the fish-to-man diagrams suggest an evolutionary hierarchy redolent of social and political preoccupations of the time. According to the caption for the frontispiece of Gregory's book *Our Face from Fish to Man*, the series culminates in a "Roman athlete." (See figure 8.) The figure beneath the Roman athlete--but superior to a chimpanzee--represents, the caption tells us, a Tasmanian. The face of the Tasmanian contrasts oddly with its antecedents. Half smiles seem to play across the faces of the "lower" animals, giving them benign, almost friendly appearances. In its facial expression the gorilla is the most anthropomorphic of the animal faces, suggesting a progression of animal sentiments from fish to man. The Tasmanian, unlike the lower animals, scowls, betraying a distinctly less friendly attitude.<sup>26</sup>

To some members of the public, the diagrams conceived at the American Museum might seem to include entirely too many ideas. Both Gregory and Osborn, his mentor at the American Museum, were active in the eugenics movement. As has often been pointed out, racial and eugenics themes were prominent in the famous Hall of the Age of Man exhibit whose construction began in 1915; indeed, Osborn made special efforts to complete the exhibit in time for the International Eugenics Congress held at the museum in 1921. Since many biologists of the time were active in the eugenics movement, it would be hard to say that eugenicist views were disproportionately represented among the scientists defending Scopes in the press. But it is certainly true that many of his defenders held such views and voiced them relentlessly. Textbooks--including Hunter's *Civic Biology*--routinely incorporated messages about racial hierarchy and eugenics. It is reasonable to ask whether those ideas limited their audience--Osborn, for example, referred to "our" Nordic heritage in his articles in the American Museum's popular magazine *Natural History*.<sup>27</sup>

Americans of non-Nordic ethnic heritage might have found the linear view of evolution implied in many diagrams less than compelling, since the linear model was implicitly--and sometimes explicitly--hierarchical. Diagrams presenting humans as the apex of the evolutionary process often positioned particular humans at the pinnacle and others closer to the animals or to more "primitive" branches of the family tree. Even diagrams intended to convey the complexity of evolutionary patterns, as many of Gregory's were, could reinforce the message of racial hierarchy. Osborn had photographs of one of Gregory's tree diagrams from the Hall of the Age of Man sent to Dayton, Tennessee, for the edification of Scopes trial jurors and the public. The same tree appeared in several newspapers during the summer of the trial, in some cases with a photo of Osborn as an inset. This diagram suggested some of the themes in Gregory's "Animals of the Past, Animals of the Present" diagram (figure 7), but with a significant difference. Focused on a single, bifurcated branch of a larger tree whose existence was indicated by a trunk at the left side of the picture, it implied that human evolution occurred somewhere other than at the pinnacle of the tree. The lineage of the



primates was decisively separated from that of humans and their ancestors. But the living members of the primate family aligned themselves in the familiar chain-of-being pattern, this time vertically, at the right-hand side of the diagram. At least one newspaper that published a photograph of this diagram included an exceptionally long caption, explaining to the public what the image meant. The verbal explanation emphasized that the white race of humans--represented by an "American"--belonged on "the topmost twig" of this vertical hierarchy and that "on the same stalk, in lower order, are placed the Australian native, the negro and the Chinese." The public had reason to be all too familiar with the grammar of racial messages and with the cartoon brutalizing of ethnic "others." The "ape-man" (supposedly intermediate between apes and humans) so often mentioned in the popular press of the 1920s had a long history of association with ethnic imagery.<sup>28</sup>

Despite the best efforts of evolutionary biologists, the average man or woman, John or Jane Doe, had good reason for associating evolution with ape-men. Newspaper accounts of the trial referred endlessly to the event in Dayton as the "monkey trial." The more combative opponents of evolution, such as Billy Sunday and John Roach Straton, gleefully labeled evolution "the jungle theory" and hammered relentlessly on the monkey theme. Moviegoers could see Dr. Challenger confront and vanquish ferocious ape-men in *The Lost World*. Monkeys appeared everywhere in 1925, as they had in the years following Darwin's publication of *On the Origin of Species* in 1859.

Even as staunch a defender of evolution as Henry Fairfield Osborn found the notion of a close relationship between humans and the great apes unsavory. Osborn's trees revealed a profound ambivalence about human evolution. Indeed, the trial seems to have ignited an already smoldering disagreement between Osborn and many of his colleagues over the evolutionary distance separating humans and anthropoid apes. Osborn insisted more and more forcefully--and publicly--during and after the trial that the lineage that led to humans had split off from the rest of the primates as long ago as the Eocene--at the base of the human family tree--a theory in which very few evolutionary scientists concurred. Increasingly, Osborn attempted to reassure a hesitant public by suggesting that the "ape-man theory" of human descent was a myth, which would eventually be replaced with his own far more palatable "dawn-man" theory. William King Gregory engaged in public debates with his mentor in which he suggested that Osborn's religious convictions had clouded his scientific judgment. Gregory perceived Osborn's debates with Fundamentalists as ironic, remarking that Osborn, a religious and conservative person, sought to resolve concerns about human ancestry "by abolishing apes" from the family tree. "In this way," Gregory commented wryly, "sensitive souls may be able to hear the word 'gorilla' without shuddering." In the heat of the debate with Fundamentalists, Osborn had become, Gregory joked, a "pithecofobiac."<sup>29</sup>

While antievolutionists such as Bryan demanded that diagrams put spatial distance between the human and the ape, Osborn, who had spent most of his life thinking in terms of geologic time, insulated humans from their anthropoid relatives by allocating extra millions of years to the recent period for the two lineages to grow apart. He tried to accomplish this buffering not only by altering the shapes of family tree diagrams but also--through his influence on artists and scientists who created them--in the design of busts and murals depicting human ancestors. Pictorially, the distance between early and more recent human ancestors could be represented rather subtly. A popular display at the American Museum, a series of busts of hominids created by the biologist J. H. McGregor, again under Osborn's direction, attempted to illustrate not only the appearances of human ancestors but also the method used to reconstruct them from fossils. (See figure 9.) Incorporating McGregor's method in its display, for

example, by including busts that exposed the skull on one side of the head and displayed a fleshed-out image on the other, the exhibit emphasized scientific objectivity. In an article in *Natural History*, the museum's journal aimed at a popular audience, McGregor wrote that in reconstructing the features of a Neanderthal male from fossils he had "tried to be conservative, to follow only the guidance of anatomical fact, minimizing my personal equation in the work as far as possible, and avoiding any inclination to make the result either bestial or brutal." McGregor admitted that "as a concession to popular taste" he had added hair styles and, in the case of the Neanderthal figure, a beard--obviously not deducible from fossil evidence. "But," he added, "the Neanderthal species was human, not brute."<sup>30</sup>

Scrupulously scientific as he intended to be, McGregor cautioned readers that busts reconstructed from fossil evidence could never be "individual portraits, but type models or racial portraits." In the article on his restoration of the Neanderthal, he stressed that pictures representing Neanderthals as African had been mistaken: "the negroid condition is almost certainly not a primitive character, but a racial specialization."<sup>31</sup> This was not a trivial point. Expeditions financed by the American Museum fanned out across central Asia in search of hominid fossils that might prove that continent to be the "birthplace" of humankind, dismissing claims for Africa and discounting the 1924 discovery of the first specimen of *Australopithecus africanus*.

The links between racial prejudice and the search for an Asian hominid ancestor were made explicit in a newspaper article by the British paleontologist Arthur Keith. Conceding that the evidence for African origins of *Homo sapiens* was strong, Keith insisted that the most advanced of human ancestors, Cro-Magnon, must have come from somewhere other than Africa. Why? Setting aside all archaeological evidence, he wrote frankly, "My preference for Asia is founded on a belief in the virtues of race. . . . My racial prejudice leads me to seek for the Cro-Magnon cradle--the evolutionary center of the white man--in . . . Asia . . . partly because the native peoples of Africa lack the progressive genius of the Asiatic." We know, Keith furthermore asserted, that the Cro-Magnon artists had to have been white people, because they had a gift for art.<sup>32</sup>

For eugenicists such as Osborn and Keith, a lot was at stake in the definition of Cro-Magnon people. A subtle interpretive refinement in the series of busts for the American Museum served to separate the more recent human ancestors, Neanderthal and Cro-Magnon, from their progenitors. McGregor made earlier hominids--*Pithecanthropus*, or "Java Man," and *Eoanthropus*, the fabricated Piltdown specimen--somewhat openmouthed (if not quite slack-jawed), in contrast to the resolute looking Neanderthal and the more recent Cro-Magnon, who vaguely resembled Thomas Jefferson. The museum supplied slides of the McGregor reproductions to many teachers for use in classrooms. Like many other exhibits from the museum, the series frequently found its way into textbooks and John Doe books. It also adorned advertisements for those books, as well as for books not exclusively about evolution, such as a 1925 edition of H. G. Wells's *Outline of History*, and even for antievolution books. When the McGregor sculptures appeared in advertisements for antievolution books, the progressive sequence of human ancestry was replaced by a single bust, of one of the more primitive members of the family. God--or Gorilla, a well-publicized book by Alfred Watterson McCann, focused explicitly and at length on the exhibits at the American Museum, accusing Osborn and McGregor of duplicity and deceit. McGregor's reconstructions, McCann charged, were shameless fabrications, works of determined imagination based on an appalling lack of evidence. An advertisement promoting the book, referring to "the Tadpole and Monkey Theory of Evolution" as "barnyard materialism" was illustrated with a single picture, a

reproduction of McGregor's openmouthed Pithecanthropus. A privately published antievolution book by Nathan G. Moore, a lawyer, also reproduced McGregor's figures but on widely separated pages, emphasizing his contention that the sequence was imaginary. This sort of thing must have exasperated Osborn, who revealed in an essay in the Forum, "I am perhaps more proud of having helped to redeem the character of cave men than of any other single achievement of mine in the field of anthropology."<sup>33</sup>

In a 1925 issue of the Forum, he recounted a trip to see cave paintings in Europe, recording his admiration for the artists. A silhouette of a Cro-Magnon cave artist graced the advertisement in the New York Times Book Review for his 1925 book, *The Earth Speaks to Bryan*, dedicated to John Thomas Scopes. (See figure 10.) The silhouette came from a magnificent painting by the artist Charles R. Knight, part of a series for exhibit at the museum, depicting what Osborn called the ascent from Neanderthal to Cro-Magnon and painted, as usual, under Osborn's direction. Among the most popular exhibits at the American Museum, these murals of early humans represented an unusually large investment, and they were widely disseminated by reproductions in books for John Doe.<sup>34</sup>

Knight composed his painting to focus on the Cro-Magnon artist, a shaft of light (in a technique reminiscent of the tradition of European Christian religious art) highlighting the production of a sophisticated cave art. Osborn and Knight clearly intended this Cro-Magnon artist to represent the gulf separating early from advanced humans--the difference was art. This painting represents the essence of Osborn's response to concerns, like Bryan's, about the place of the human soul in evolution.

In *The Earth Speaks to Bryan*, Osborn asserted, "We naturalists accept as transcendent the teaching that the universe is by no means the result of accident or chance, but of an omnipresent beauty and order, attributed in the Old Testament to Jehovah, in our language to God." Not all of the scientists engaged in the Scopes debate would travel as far as Osborn in this direction, but many of them navigated the same path. Similar rhetoric colored statements of such defenders of evolution as the biologists Edwin Grant Conklin, David Starr Jordan, John C. Merriam, and Charles Doolittle Walcott, all eminent figures. Such language also appeared in a "Joint Statement upon the Relations of Science and Religion, by Religious Leaders and Scientists," published in *Science* and known as the Millikan Manifesto because it was written and promoted by the physicist Robert A. Millikan, a Nobel laureate.<sup>35</sup>

The editors of the *New Republic* took statements "defending evolution as the very pattern of God's wisdom" as part of a rhetorical strategy adopted by scientists, and one they deplored. An editorial described a movie about evolution made under the direction of American Museum scientists and "shown in all the better theatres" in the summer of the Scopes trial as "quite remarkable" in its effects. But the film concluded with a disturbing message, drawn from a ubiquitous piece of doggerel: "Some call it evolution / And others call it God." Naming Osborn as one of the scientists broadcasting this sentiment in the popular media, the editor complained, "It can do no good to point out that 'god' is not a scientific conception, that scientific researches reveal nothing but material facts, that spiritual principles are as irrelevant to biological evolution as jabberwocky. Every scientist knows this." Emphasizing Osborn's stature explicitly, he went on, "No one understands better than the president of the American Museum of Natural History that in the process of biological evolution the one test of fitness is the fact of survival. . . . Nothing could be further from any 'spiritual principle' than biological evolution."<sup>36</sup>

But Osborn apparently understood no such thing. In the Forum essay recording his admiration for the cave artists, Osborn wrote: "Creation of this man of a higher order, known as the Cro-Magnon, with his moral, spiritual, and intellectual powers, is utterly incomprehensible as purely a process of the survival of the fittest." Ironically, Osborn's insistence that science was not only compatible with religion, but "furnished" "a sublime conception of God" meant that he ultimately insisted on the separation of all of human evolution from animal evolution, a limited form of consolation at best. In his efforts to weave God into the fabric of evolutionary theory, he failed to convince antievolutionists and alienated scientific colleagues. It might have surprised Bryan to learn that in a discussion of the mechanism of evolution, the geneticist Thomas Hunt Morgan had accused Osborn of having exempted mammals from the processes of evolution. "I am sorry to hear," Morgan wrote to Osborn, "that the mammals have not evolved by mutation. It would be too bad to leave them out of the general scheme, . . . and I cannot but hope that you will relent some day and let us have the mammals back."<sup>37</sup>

Osborn and Knight's Cro-Magnon cave artist suggested a noble vision of the human past, a vision that might distance the human essence from the ape-to-man sequence and offer doubters such as Bryan a separate circle for the human soul. It would almost seem that he and Osborn ultimately shared similar concerns. And they did. Ironically, had Osborn been able to assert with the editor of the *New Republic* that the question of the soul, like that of God, lay beyond the boundaries of science, his responses to Bryan might have been more convincing. But in his insight that scientific diagrams are not necessarily neutral about issues of values, Bryan put his finger on an important problem in the evolution debates.

The nobility implicit in Osborn's image of the human essence as artist was severely compromised by his insistence on associating that image with messages about racial hierarchy. In addition, Osborn, like many biologists of the decade, was unable to relinquish the vision of a purposeful evolution, and this version of evolution shaped many of the scientific illustrations he put on exhibit at the museum. By 1925 the idea of purpose in evolution was hotly contested among scientists; it also failed to compel not only Bryan and his followers but many other thoughtful people, including more secular-minded members of the public. As one letter to the *New Republic* pointed out, "it is difficult to imagine anything more terrible than the laws of nature with purpose read into them."<sup>38</sup>

Another writer who objected strenuously to the implication that science could reveal anything important about values and religion, the novelist and essayist G. K. Chesterton, published a book in 1925 that dwelt on the public image of cave men. It was pure fantasy, Chesterton wrote, to derive any message about cave people from the existing evidence, with one exception. The one thing known without a doubt about cave people was that they produced a subtle and sophisticated art. We could therefore infer that they were human. "Art is the signature of man," Chesterton declared, sounding a good deal like Osborn. Unlike Osborn, though, he argued that cave art implied that the one thing that really mattered--the human soul--was not something science could contemplate. Art, and therefore the human soul, had appeared suddenly and complete: "Monkeys did not begin pictures and men finish them; Pithecanthropus did not draw a reindeer badly and Homo Sapiens draw it well." The cave man caricature in the comics obscured the important lesson.<sup>39</sup>

The cave artists from whom Chesterton and Knight drew meaning were not necessarily able to compete in the public's imagination with the cave men and women populating the cartoons. Under any circumstances the popular press might have found the potential humor of monkey images irresistible, but the mixed messages sent by science advocates undoubtedly

exacerbated the confusion. The linear chain-of-being images of evolution so prevalent in the literature for John Doe probably did more to undermine assurances that humans are not directly descended from apes than words could have done. And as a colleague, William McDougall, wrote to Osborn, "surely the question the public is interested in is not whether man is ascended from some existing species of ape, but whether from any ape-like form." McDougall wondered if Osborn's argument was not disingenuous: his statements discarding the "ape-monkey theory" were accompanied by diagrams supporting that very theory.<sup>40</sup>

No matter how many words evolutionists wrote acknowledging the complexity of evolutionary patterns, the public discourse was saturated with visual allusions to a linear, goal-directed, and hierarchical version of evolution. For a public accustomed to the visual cacophony of the monkey motif and linear hierarchies from fish to man, the story the pictures told was exactly the story that Evolution for John Doe denied, "the doctrine that man is descended from monkeys." This was the common sense made familiar in evolution-based cartoons, jokes, science fiction, and movies. It was reinforced by the very people who tried to counter it with scientific images. Scientific diagrams may never have convinced anyone to switch sides in the evolution debate, but they did something more important. They subtly conveyed the notion that evolution works in a linear, goal-directed fashion, and they did this in a context that inextricably linked evolutionary progress with the racist obsessions of the time.

In the political and cultural context of 1920s America, images of evolutionary history that implied linear ascent perhaps inevitably evoked more familiar cultural hierarchies. While scientists rallied to the defense of evolution, their messages were often inconsistent, and cultural preoccupations were woven into them. The pictures presented to the public during the Scopes trial debate told eloquent stories, saying both more and less than their authors intended.

---

Constance Areson Clark is a graduate student at the University of Colorado at Boulder. This essay received the Louis Pelzer Memorial Award for 2000.

Many thanks for their insightful comments on various (in several cases, numerous) drafts, especially to Mark Pittenger and Phil Deloria, and to Fred Anderson, Virginia Anderson, Lee Bernstein, Tracy Brady, Carol Byerly, Paul Conkin, John Enyeart, Susan Jones, Susan Kent, Gloria Main, Gerry Ronning, Rickie Solinger, and Sharyn Yeoman. Thanks also to the members of the Pelzer Prize committee and especially to David Nord and George Roeder for detailed, perceptive, and tactful suggestions for revisions; to Susan Armeny, who with kindness, patience, and an acute editorial sense helped me not only to write more clearly, but to think more precisely; to Scott Miller and Dianne Johnson for good-humored and effective moral and logistic support; to the Beverly Sears Fund at the University of Colorado for a travel grant; to Abigail Dyer and Susan Bednarczyk, generous hosts in New York; to the librarians and archivists at the American Museum of Natural History, especially Barbara Matthe, Matt Pavlick, Mark Katzman, and Sarah Yeates, for their graciousness, efficiency, and kindness, and to Eleanor Schwartz, for her admirable organization of the Osborn Papers. Thanks especially to Bob Bakker for more reasons than I can list here, to Priscilla Lyons for her sense of humor, and to Katherine Clark, Richard Areson Clark, Betty Abraham Clark, and

Bob Bakker for perceptive comments on this paper and for years of great and lively discussions about art, science, and history. This paper is dedicated to Richard Areson Clark.

Readers may contact Clark at [constance.clark@colorado.edu](mailto:constance.clark@colorado.edu).

1 Joseph Wood Krutch, *More Lives Than One* (New York, 1962), 153; Joseph Wood Krutch, "The Monkey Trial," *Commentary*, 43 (May 1967), 84.

2 Tennessee Evolution Case: A Complete Stenographic Report of the Famous Court Test of the Tennessee Anti-Evolution Act, at Dayton, July 10 to 21, 1925, Including Speeches and Arguments of Attorneys (Cincinnati, 1925), 174-77; George William Hunter, *A Civic Biology Presented in Problems* (New York, 1914), 194.

3 The phrase "acids of modernity" is Walter Lippmann's; see Lynn Dumenil, *The Modern Temper: American Culture and Society in the 1920s* (New York, 1995), 148. Frederick Lewis Allen, *Only Yesterday: An Informal History of the 1920s* (New York, 1931); *Inherit the Wind*, dir. Stanley Kramer (United Artists, 1960); Lawrence W. Levine, *Defender of the Faith: William Jennings Bryan, the Last Decade, 1915-1925* (Cambridge, Mass., 1987); Garry Wills, *Under God: Religion and American Politics* (New York, 1990); Edward Larson, *Summer for the Gods: The Scopes Trial and America's Continuing Debate over Science and Religion* (New York, 1997); Ronald L. Numbers, *Darwinism Comes to America* (Cambridge, Mass., 1998); Paul K. Conkin, *When All the Gods Trembled: Darwinism, Scopes, and American Intellectuals* (Lanham, 1998). For recent revisions of the Scopes trial and its context, see also Edward Larson, *Trial and Error: The American Controversy over Creation and Evolution* (New York, 1989); James Gilbert, *Redeeming Culture: American Religion in an Age of Science* (Chicago, 1997), 23-35; and George E. Webb, *The Evolution Controversy in America* (Lexington, Ky., 1994). On the reception of Darwinism, see Jon H. Roberts, *Darwin and the Divine in America: Protestant Intellectuals and Organic Evolution, 1859-1900* (Madison, 1988); Ronald L. Numbers and John Stenhouse, eds., *Disseminating Darwinism: The Role of Place, Race, Religion, and Gender* (New York, 1999); James R. Moore, *The Post-Darwinian Controversies: A Study of the Protestant Struggle to Come to Terms with Darwin in Great Britain and America, 1870-1900* (Cambridge, Eng., 1979); David L. Hull, *Darwin and His Critics: The Reception of Darwin's Theory of Evolution by the Scientific Community* (Chicago, 1973); Peter J. Bowler, *Life's Splendid Drama: Evolutionary Biology and the Reconstruction of Life's Ancestry, 1860-1940* (Chicago, 1996); Peter J. Bowler, *The Eclipse of Darwinism: Anti-Darwinian Evolution Theories in the Decades around 1900* (Baltimore, 1983); Peter J. Bowler, *The Non-Darwinian Revolution: Reinterpreting a Historical Myth* (Baltimore, 1988); Peter J. Bowler, "Darwinism and Modernism: Genetics, Palaeontology, and the Challenge to Progressionism, 1880-1930," in *Modernist Impulses in the Human Sciences, 1870-1930*, ed. Dorothy Ross (Baltimore, 1994), 236-54; Mark Pittenger, *American Socialists and Evolutionary Thought, 1870-1920* (Madison, 1993); and Paul Jerome Croce, *Science and Religion in the Era of William James: Eclipse of Certainty, 1820-1880* (Chapel Hill, 1995). On the general cultural background of the United States in the 1920s, see Dumenil, *Modern Temper*; and Warren I. Susman, *Culture As History: The Transformation of American Society in the Twentieth Century* (New York, 1973).

4 On the recent literature analyzing visual culture in history, see George H. Roeder Jr., "Filling in the Picture: Visual Culture," *Reviews in American History*, 26 (March 1998), 275-93.

5 Martin J. S. Rudwick's knowledge of scientific practice is firsthand: before becoming a historian, he was an invertebrate paleontologist and his early work is still cited by paleontologists. Martin J. S. Rudwick, "The Emergence of a Visual Language for Geological Science, 1760-1840," *History of Science*, 14 (Sept. 1976), 149-95; Martin J. S. Rudwick, *Scenes from Deep Time: Early Pictorial Representations of the Prehistoric World* (Chicago, 1992). See also "Special Issue: Seeing Science," *Representations*, 40 (Fall 1992); "Special Issue on Pictorial Representation in Biology," *Biology and Philosophy*, 6 (April 1991); the special issue "Science and the Visual," *British Journal for the History of Science*, 31 (June 1998); Stephanie Moser, *Ancestral Images: The Iconography of Human Origins* (Ithaca, 1998); Brian S. Baigre, ed., *Picturing Knowledge: Historical and Philosophical Problems Concerning the Use of Art in Science* (Toronto, 1996); Michael Lynch and Steve Woolgar, eds., *Representation in Scientific Practice* (Cambridge, Mass., 1990); Thomas L. Hankins and Robert J. Silverman, *Instruments and the Imagination* (Princeton, 1995); Bruno Latour, "Visualization and Cognition: Thinking with Eyes and Hands," *Knowledge and Society*, 6 (1986), 1-40; Caroline A. Jones and Peter Galison, eds., *Picturing Science Producing Art* (New York, 1998); Stephen Jay Gould, *Full House: The Spread of Excellence from Plato to Darwin* (New York, 1996); Stephen Jay Gould, "Ladders and Cones: Constraining Evolution by Canonical Icons," in *Hidden Histories of Science*, ed. Robert B. Silvers (New York, 1995), 37-67; Stephen Jay Gould, *The Mismeasure of Man* (New York, 1996), 401-12; and Charlotte M. Porter, "Essay Review: The History of Scientific Illustration," *Journal of the History of Biology*, 28 (Fall 1995), 545-50.

6 William Jennings Bryan and Mary Baird Bryan, *The Memoirs of William Jennings Bryan* (Philadelphia, 1925), 535. See also Levine, *Defender of the Faith*; Larson, *Summer for the Gods*, esp. 37-59; Wills, *Under God*, 97-137; and Stephen Jay Gould, *Bully for Brontosaurus: Reflections in Natural History* (New York, 1991), 416-31.

7 Michael M. Sokal, "Promoting Science in a New Century: The Middle Years of the aaas," in *The Establishment of Science in America: 150 Years of the American Association for the Advancement of Science*, ed. Sally Gregory Kohlstedt, Michael M. Sokal, and Bruce V. Lewenstein (New Brunswick, 1999), 50-102.

8 Peter J. Bowler suggests that paleontologists of the early twentieth century, while retaining a teleological evolutionary philosophy, had a view of evolutionary processes more complicated than the views predominant before 1900. Fragmentation and competition among newly professionalized disciplines exacerbated the unsettled state of evolutionary theory, pitting scientists in the young discipline of genetics, for example, against those in the older fields of morphology and paleontology, and laboratory-based scientists against field scientists. See Bowler, *Eclipse of Darwinism*; Bowler, "Darwinism and Modernism"; Garland Allen, *Life Science in the Twentieth Century* (New York, 1975); Ronald Rainger, Keith Benson, and Jane Maienschein, eds., *The American Development of Biology* (Philadelphia, 1988); Paul Lawrence Farber, *Finding Order in Nature: The Naturalist Tradition from Linnaeus to E. O. Wilson* (Baltimore, 2000); Ernst Mayr and William Provine, eds., *The Evolutionary Synthesis: Perspectives on the Unification of Biology* (Cambridge, Mass., 1980); and Vassiliki Betty Smocovitis, *Unifying Biology: The Evolutionary Synthesis and Evolutionary Biology* (Princeton, 1996).

9 On Henry Fairfield Osborn and his colleagues, the history of the American Museum of Natural History, and the history of museums generally, see Ronald Rainger, *An Agenda for Antiquity: Henry Fairfield Osborn and Vertebrate Paleontology at the American Museum of*

Natural History, 1890-1935 (Tuscaloosa, 1991); John Michael Kennedy, "Philanthropy and Science in New York City: The American Museum of Natural History, 1868-1968" (Ph.D. diss., Yale University, 1968); Sheila Ann Dean, "What Animal We Came From: William King Gregory's Paleontology and the 1920's Debate on Human Origins" (Ph.D. diss., Johns Hopkins University, 1994); Edwin H. Colbert, William Diller Matthew, Paleontologist: The Splendid Drama Observed (New York, 1992); Donna Haraway, Primate Visions: Gender, Race, and Nature in the World of Modern Science (New York, 1989), 26-58; Charlotte Porter, "Henry Fairfield Osborn and the Hall of the Age of Man," *Museum Studies Journal*, 1 (Spring 1983), 26-34; Greg Mitman, *Reel Nature: America's Romance with Wildlife on Film* (Cambridge, Mass., 1999); Sally Gregory Kohlstedt, "Essay Review: Museums: Revisiting Sites in the History of the Natural Sciences," *Journal of the History of Biology*, 28 (Spring 1995), 151-66; and Steven Conn, *Museums and American Intellectual Life, 1876-1926* (Chicago, 1998).

10 Newspapers as far from New York as California covered the Osborn-Straton exchange. See letters and clippings about it, folder 4, box 21, Osborn Papers (Library, American Museum of Natural History, New York, N.Y.). See especially Henry Fairfield Osborn to John Roach Straton, March 8, 1924, *ibid.*; John Roach Straton, "Making Poison Plausible," sermon, 1924, *ibid.*; and John Dickenson Sherman, "'Treason to God Almighty': Rev. Dr. J. R. Straton Denounces American Museum of Natural History," newspaper clipping, Fort Bragg [California] News, May 3, 1924, *ibid.* See also John Roach Straton and Charles Francis Potter, *Evolution versus Creation: Second in the Series of Fundamentalist-Modernist Debates* (1924), in *Creationism in Twentieth-Century America: A Ten-Volume Anthology of Documents, 1903-1961*, ed. Ronald L. Numbers, vol. II: *Creation-Evolution Debates* (New York, 1995), 21-131.

11 New York Times, Jan. 14, 1926, p. 6.

12 The Osborn Papers at the American Museum of Natural History contain many reviews of his own and others' books of this type. For materials relating to *Men of the Old Stone Age*, see box 99, Osborn Papers; to *Earth Speaks to Bryan*, box 92, *ibid.*; to Mason, ed., *Creation by Evolution*, box 14, *ibid.* Sales figures for Osborn's books during the 1920s are in folders 7-11, box 56, *ibid.* On the window display at Brentano's, see Sterling Galt to Charles Scribner, memo, July 21, 1925, folder 2, box 92, *ibid.* "Books for Babbitt," *World's Work*, 58 (June 1929), copy of clipping, folder 14, box 14, *ibid.* See also Susman, *Culture as History*, 105-21; James Steel Smith, "The Day of the Popularizers: The 1920's," *South Atlantic Quarterly*, 62 (Spring 1963), 297-309; and Joan Shelley Rubin, *The Making of Middlebrow Culture* (Chapel Hill, 1992).

13 Henshaw Ward, *Evolution for John Doe* (Indianapolis, 1925), 15. Other books in this genre include Henry C. Crampton, *The Coming and Evolution of Life: How Living Things Have Come to Be As They Are* (New York, 1931); Edwin Grant Conklin, *The Direction of Human Evolution* (New York, 1922); Benjamin C. Gruenberg, *The Story of Evolution: Facts and Theories on the Development of Life* (Garden City, 1929); John Langdon-Davies, *The New Age of Faith* (New York, 1925); Frederic A. Lucas, *Animals of the Past: An Account of Some of the Creatures of the Ancient World* (New York, 1922); Richard Swann Lull et al., *The Evolution of Man* (New Haven, 1922); Frances Mason, ed., *Creation by Evolution: A Consensus of Present-Day Knowledge As Set Forth by Leading Authorities in Non-Technical Language That All May Understand* (New York, 1928); Kirtley Mather, *Sons of the Earth: A Geologist's View of History* (New York, 1930); Shailer Mathews, ed., *Contributions of*



Science to Religion (New York, 1924); Horatio Hackett Newman, *Readings in Evolution, Genetics, and Eugenics* (Chicago, 1921); Horatio Hackett Newman et al., *The Nature of the World and of Man* (Chicago, 1926); Henry Fairfield Osborn, *Men of the Old Stone Age: Their Environment, Life, and Art* (New York, 1916); Henry Fairfield Osborn, *The Origin and Evolution of Life* (New York, 1918); Henry Fairfield Osborn, *Man Rises to Parnassus: Critical Epochs in the Prehistory of Man* (Princeton, 1928); Lucretia Perry Osborn, *The Chain of Life* (New York, 1925); Harold Peake and Herbert John Fleure, *Apes and Men* (New Haven, 1927); Chester A. Reeds, *The Earth: Our Ever-Changing Planet* (New York, 1931); William Berryman Scott, *The Theory of Evolution: With Special Reference to the Evidence upon Which It Is Founded* (New York, 1923); G. Elliott Smith, *The Evolution of Man: Essays* (London, 1924); Adam Gowans Whyte, *The Wonder World We Live In* (New York, 1921); H. G. Wells, Julian Huxley, and G. P. Wells, *The Science of Life* (New York, 1929); and H. G. Wells, *Outline of History: Being a Plain History of Life and Mankind* (New York, 1920). See also Ronald C. Tobey, *The American Ideology of National Science, 1919-1930* (Pittsburgh, 1971).

14 On the history of evolutionary tree diagrams, see Stephen G. Alter, *Darwinism and the Linguistic Image: Language, Race, and Natural Theology in the Nineteenth Century* (Baltimore, 1999); Gould, "Ladders and Cones"; Stephen Jay Gould, *The Lying Stones of Marrakech: Penultimate Reflections in Natural History* (New York, 2000), 115-43; Bowler, "Darwinism and Modernism," 247-54; Robert J. O'Hara, "Representations of the Natural System in the Nineteenth Century," *Biology and Philosophy*, 6 (April 1991), 255-74; William Coleman, "Morphology between Type Concept and Descent Theory," *Journal of the History of Medicine and Allied Sciences*, 31 (no. 2, 1976), 149-75; H. J. Lam, "Phylogenetic Symbols, Past and Present," *Acta Biotheoretica*, 2 (Oct. 1936), 153-94; Edward G. Voss, "The History of Keys and Phylogenetic Trees in Systematic Biology," *Journal of the Scientific Laboratories of Denison University*, 43 (Dec. 1952), 1-25; Howard E. Gruber, "Darwin's 'Tree of Nature' and Other Images of Wide Scope," in *On Aesthetics in Science*, ed. Judith Wechsler (Cambridge, Mass., 1978), 121-40; and Theodore D. McCown and Kenneth A. R. Kennedy, eds., *Climbing Man's Family Tree: A Collection of Major Writings on Human Phylogeny, 1699 to 1971* (Englewood Cliffs, 1972).

15 Charles Darwin, *On the Origin of Species: A Facsimile of the First Edition* (1859; Cambridge, Mass., 1964); Gruber, "Darwin's 'Tree of Nature' and Other Images of Wide Scope."

16 Ernst Haeckel, *The Evolution of Man* (1866; New York, 1896), 189; Jane M. Oppenheimer, "Haeckel's Variations on Darwin," in *Biological Metaphor and Cladistic Classification: An Interdisciplinary Perspective*, ed. Henry M. Hoenigswald and Linda F. Wiener (Philadelphia, 1987), 123-35; Alter, *Darwinism and the Linguistic Image*, 108-45; Bowler, "Darwinism and Modernism," 247-54; Gould, "Ladders and Cones."

17 Henry Fairfield Osborn, *The Age of Mammals in Europe, Asia, and North America* (New York, 1910), 7.

18 A similar tree, used as the frontispiece for a 1921 book, outfitted the human at the top of the tree in the garb of the stereotyped "cave man." See Whyte, *Wonder World We Live In*, n.p. The cave man is obviously taken from a 1911 picture published in the *Illustrated London News* and reproduced in Moser, *Ancestral Images*, 155.

19 Horse diagrams were often drawn to support Osborn's linear, progressive model of evolution. See Rainger, *Agenda for Antiquity*, 164-65, 208-10. W. D. Matthew, "The Evolution of the Horse: A Record and Its Interpretation," *Quarterly Review of Biology*, 1 (no. 2, 1926), 139-85; American Museum of Natural History, *Evolution of the Horse* (New York, 1924); Thomas Henry Huxley, *American Addresses* (London, 1877), 71-90; Gould, *Full House*, 57-88; Gould, *Bully for Brontosaurus*, 168-81; George Gaylord Simpson, *Horses: The Story of the Horse Family in the Modern World and through Sixty Million Years of History* (Garden City, 1961).

20 W. Maxwell Reed, *The Earth for Sam* (New York, 1930).

21 Bowler, "Darwinism and Modernism."

22 Thomas Henry Huxley, *Man's Place In Nature* (1863; Ann Arbor, 1959), frontispiece (n.p.), 129-30. See also Nicholas Rupke, *Richard Owen: Victorian Naturalist* (New Haven, 1994); and Adrian Desmond, *Huxley: From Devil's Disciple to Evolution's High Priest* (Reading, 1997).

23 For a discussion of recent versions of this joke, from a perspective that differs from mine, see Gould, "Ladders and Cones." *New Yorker*, June 6, 1925, p. 3. For another example, see Judge, July 18, 1925, p. 2.

24 Thanks to George Roeder for the observation that William King Gregory's diagram made its "working hypothesis" nature explicit, and for the suggestion that this could explain why such trees did not find their way into popular books. William King Gregory and Marcelle Roigneau, *Introduction to Human Anatomy: Guide to Section I of the Hall of Natural History of Man* (New York, 1934).

25 For Gregory's discussions of human evolution, tree diagrams, and mosaic evolution, see, for example, William King Gregory, "Studies on the Evolution of the Primates," *Bulletin of the American Museum of Natural History*, 35 (1916), 239-355; William King Gregory, *Our Face from Fish to Man: A Portrait Gallery of Our Ancient Ancestors and Kinsfolk together with a Concise History of Our Best Features* (New York, 1929); William King Gregory, "The Origin, Rise, and Decline of *Homo sapiens*," *Scientific Monthly*, 39 (Dec. 1934), 481-96; and William King Gregory, "Supra-specific Variation in Nature and in Classification: A Few Examples from Mammalian Paleontology," *American Naturalist*, 71 (Jan.-Feb. 1937), 268-76.

26 Gregory, *Our Face from Fish to Man*, frontispiece (n.p.). The caption accompanies the frontispiece, which shows the same faces in a more tree-like arrangement. I am grateful to Richard Areson Clark for his perceptive reading of this diagram.

27 Henry Fairfield Osborn, "Our Ancestors Arrive in Scandinavia," *Natural History*, 22 (March-April 1922), 116-34; Rainger, *Agenda for Antiquity*; Dean, "What Animal We Came From"; Daniel J. Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (New York, 1985); Philip J. Pauly, "Essay Review: The Eugenics Industry--Growth or Restructuring?," *Journal of the History of Biology*, 26 (Spring 1993), 131-45.

28 For a reference to this diagram in a context that emphasizes Osborn's disagreement with Gregory, see Dean, "What Animal We Came From," 220, 291. "Ascent to Utopia Evolution's Aim, Says Savant, Decrying Quibbling," *Poughkeepsie Enterprise*, June 22, 1925, clipping,

folder 14, box 19, Osborn Papers; New York Times, July 12, 1925, sec. 8, p. 1; William King Gregory, "Did Man Originate in Central Asia?," *Scientific Monthly*, 24 (May 1927), 385-401; George Grant MacCurdy, "Old Problems and New Methods in Prehistory," *Scientific American*, 134 (May 1926), 308-9; L. Perry Curtis Jr., *Apes and Angels: The Irishman in Victorian Caricature* (Washington, 1997); Moser, *Ancestral Images*.

29 Henry Fairfield Osborn, "Recent Discoveries Relating to the Origin and Antiquity of Man," *Proceedings of the American Philosophical Society*, 66 (1927), 373-89; Henry Fairfield Osborn, "Is the Ape-Man a Myth?," *Human Biology*, 1 (Jan. 1929), 4-9; Osborn, *Man Rises to Parnassus*; Osborn, *Men of the Old Stone Age*. On the disagreement between Osborn and Gregory, see Rainger, *Agenda for Antiquity*, 228-41; and Dean, "What Animal We Came From," 4, 259-300. For Gregory's statement, see George Gaylord Simpson, "William King Gregory, 1876-1970," *American Journal of Physical Anthropology*, 35 (Sept. 1971), 158.

30 J. H. McGregor, "Restoring Neanderthal Man," *Natural History*, 26 (May-June 1926), 288-93; Rainger, *Agenda for Antiquity*, 170-73.

31 McGregor, "Restoring Neanderthal Man," 289, 293.

32 On Keith's ideas about human evolution in the context of his celebration of European imperialism, see Bowler, "Darwinism and Modernism," 252-54. Rainger, *Agenda for Antiquity*, 99-104; Arthur Keith, "Whence Came the White Race?," *New York Times Sunday Magazine*, Oct. 12, 1930. A clipping of this article is in folder 2, box 12, Osborn Papers.

33 Ad for God--or Gorilla by Alfred Watterson McCann, *New York Evening Post*, June 3, 1925, p. 11; Alfred Watterson McCann, *God--or Gorilla* (New York, 1925); Nathan G. Moore, *The Theory of Evolution (An Inquiry)* (Chicago, 1931); Henry Fairfield Osborn, "Evolution and Daily Living," *Forum*, 73 (Feb. 1925), 171.

34 Ad for *The Earth Speaks to Bryan* by Henry Fairfield Osborn, *New York Times Book Review*, July 12, 1925, p. 18. For the correspondence between Osborn and Charles R. Knight about this painting see box 1, Charles R. Knight Papers (New York Public Library, New York, N.Y.); and folders 8 and 9, box 12, Osborn Papers. Moser, *Ancestral Images*, 159-60; Rainger, *Agenda for Antiquity*, 174-77; Sylvia Massey Czerkas and Donald F. Glut, *Dinosaurs, Mammoths, and Cavemen: The Art of Charles R. Knight* (New York, 1982), 68-69.

35 Henry Fairfield Osborn, *The Earth Speaks to Bryan* (New York, 1925); "Joint Statement upon the Relations of Science and Religion, by Religious Leaders and Scientists," *Science*, June 1, 1923, pp. 630-31.

36 The film quoted the last two lines of a poem by William Herbert Carruth. The complete poem is: "A fire-mist and a planet, / A crystal and a cell, / A jelly-fish and a saurian, / And caves where the cave-men dwell. / Then a glimpse of law and beauty / And a face turned from the sod:-- / Some call it Evolution / And others call it God." It was published and quoted often in the 1920s. See, for example, Straton and Potter, *Evolution versus Creation*, in *Creationism in Twentieth-Century America*, ed. Numbers, II, 49; and Langdon Smith, *Poems of Evolution* (Girard, 1924); Editor, "The Scientist Bends the Knee," *New Republic*, Aug. 5, 1925, pp. 280-81.

37 Osborn, "Evolution and Daily Living," 171; Osborn, *Earth Speaks to Bryan*, 87; Thomas Hunt Morgan to Osborn, folder 1, box 16, Osborn Papers; Rainger, *Agenda for Antiquity*, 136.

38 James J. Porter to editor, *New Republic*, Aug. 12, 1925, p. 323.

39 G. K. Chesterton, *The Everlasting Man* (New York, 1925), 34-35; Simeon Strunsky, "About Books, More or Less: Chesterton's Faith," *New York Times Book Review*, Nov. 22, 1925, p. 4.

40 Osborn once wrote that if he could, he would prohibit young people from ever reading "the irreverent funny pages." Henry Fairfield Osborn, *Creative Education in School, College, University, and Museum* (New York, 1927), 47. William McDougall to Osborn, July 15, 1925, folder 2, box 92, Osborn Papers.

File Date: 07.23.01

## **Berkeley's Radical**

### **An Interview with Phillip E. Johnson**

*Phillip E. Johnson, J.D. (University of Chicago), is Professor of Law (emeritus) at the University of California at Berkeley, where he taught for 30 years. A frequent lecturer, he is also the author of *Darwin on Trial*, *Reason in the Balance*, *Defeating Darwinism by Opening Minds*, and *The Wedge of Truth* (all InterVarsity), as well as of two textbooks on criminal law.*

*Dr. Johnson is an elder in the Presbyterian Church (U.S.A.), and he now has a regular column in *Touchstone*, "The Leading Edge." James M. Kushiner interviewed Johnson while attending a conference on *Intelligent Design* at Yale University in November 2000.*

***Touchstone: Dr. Johnson, tell us about your upbringing. Were you raised in a Christian home?***

**Phillip Johnson (PJ):** Well, I grew up in Aurora, Illinois. We went to Sunday school because it was good for us kids. We'd drop my dad off at the golf course on the way. My mother told me I had to stay until I got confirmed, then I could go my own way. During high school I went to a liberal Congregationalist church, but I never took Christian doctrine seriously. It was just part of the culture, like the Boy Scouts. It was about being nice.

I went to Harvard at 17 and assumed I was leaving all that behind. I had every intention of simply adopting the Harvard philosophy, which was secular, pragmatic, and rational, because that's what you did if you wanted to be a big deal.

***When did you go to Harvard?***

**PJ:** In 1957, which was a significant year, the year of *Sputnik*. *Sputnik* created a completely new situation in American higher education because it scared the government; they thought we were going to lose our scientific preeminence. So they poured an enormous amount of

money into the universities, especially for science. That's when the biological sciences curriculum really got started.

***When you were at Harvard, were you on the "left" or the "right"?***

**PJ:** I played at being the leftist, but I came from a conservative Midwestern background, so my instincts were always in that direction. I was just trying out my wings.

But when I got to the University of Chicago Law School, I discovered that all the bright people weren't liberals. I heard about Milton Friedman and George Stigler and other leading American economists whom I was never told about at Harvard. It was a bit of an eye-opener.

But unlike many people who go to Chicago, I didn't quite "eat the whole enchilada," which allowed me to be more flexible. I didn't completely buy into the market ideology, though I respected it.

I did well in law school, which put me in line to get top judicial clerkships, and then eventually became a professor. One of the biggest decisions I made in my life was choosing Berkeley instead of Yale. When I was a Supreme Court clerk, I was eagerly recruited by both, but I decided I'd rather live in Berkeley. The Berkeley law professors were more like me—public-school types. The Yale professors were a little too preppy for me. I thought, "Well, I'll never be a member of the club there," so I went to Berkeley.

I was a perfectly ordinary, middle-of-the-road secular rationalist, and a half-educated intellectual. I did well on tests but never worked very hard at my studies. I look back now and see that I didn't really know very much. I probably was a pretty ignorant person.

***When did you go to Berkeley?***

**PJ:** I started teaching law at Berkeley in 1967. In the 1970s they had even more student unrest at Harvard and Yale than at Berkeley. After I was at Berkeley and saw the student revolution up close, I found it wasn't very interesting. The leftist riots were old hat, and I got fed up with the irrational self-righteousness. This experience, which would have been the same at Yale, pushed me into a much more conservative set of views.

***How did you come to realize the secular view lacked something? Obviously, one of the most important decisions you made was to become a Christian. How did that happen?***

**PJ:** I became disillusioned during my thirties. The whole idea of the exciting campus ferment and student ideas became a disappointment. The academic career was also a disappointment. I think my motives for going into it, for everything I did, were rather shallow. I was basically an academic careerist seeking tenure, writing law review articles and a casebook. I had the career, but I was bored with it. I thought life ought to be more fulfilling than that. I was beginning to grow up.

I had been very happily married for some years, and then my marriage went bad. My wife got a heavy dose of the ideas that were rolling around in the '70s. She lost interest in our home and family and went off into artistic politics. After we split up, I took care of the kids. So I was disillusioned with my home life, my marriage, and my academic career.

In terms of my religious views during this period, what I usually say is, "I was raised as a nominal Christian and then I became a nominal agnostic." I didn't have any passion for it. In fact, I had read some of C. S. Lewis's books when I was in college and law school and admired them. I thought that they were attractive but not for people like me in modern times. "Too bad they aren't true" was my reaction.

When my marriage ended, I wondered what I was going to do with the rest of my life. That's when I had my conversion experience. This, I think, is true of many people; what leads you to a conversion is the loss of your faith in something else. My faith had been, "If you're a bright person with the right credentials, you'll have a happy and meaningful life." I expected that I would go from one distinguished position to the next, advance my career, be happy and satisfied, and that's what life would be about. It seemed to me that wasn't happening, and I was just going to be a law teacher for the rest of my life. It wasn't very meaningful or as good as I thought it would be. So I lost faith during that pragmatic period. Instead, I thought, "What makes me think that what I have is better than the Christian life?"

So I became a Christian when I was 38 and met my present wife, Kathie, at the First Presbyterian Church of Berkeley. Our lives were centered in that church. Kathie had been raised in a nominal Methodist home, and her first husband, like my first wife, had been very anti-Christian. So you might say we were negatively evangelized by our first spouses.

My conversion was gradual, not dramatic. The central issue for me was whether Christianity was real or imaginary. I lived in a society at the university that mostly assumed an easy-going agnosticism. So I felt it was necessary to come to a conclusion on whether Christian metaphysics were real or imaginary, or if I would be throwing my brains out the window and adopting a myth because it satisfied my personal needs.

### ***How did you resolve that question?***

**PJ:** First, I took up jurisprudence, the philosophical roots of law. That was in the wake of the emergence of what we call the Critical Legal Studies movement, which was the postmodernist, deconstructionist, epistemological relativism and Marxism that were in the English departments and had just come into the law schools, especially at Harvard and Stanford. I found it quite interesting. I was asked by the *Stanford Law Review* to contribute a negative piece to a volume of articles by leading members of the movement because they wanted an outsider's view.

I spent a whole year on that, reading these dense 120-page law review articles, studying continental philosophy, and so on, and developed a love-hate relationship with neo-Marxism. I disliked the infantile leftist politics intensely. I did agree with their critique of liberal rationalism and legal scholarship—where the law professor and the judge say, "Well, you there, you have your passions and your prejudices and your interests, whereas I just peer into the Constitution and decide what justice is." It's what I called the sham neutrality of liberal rationalism.

One of the leading examples of that was in the section on religion. In my article—my study guide of sham neutrality—I used as my textbook example the decision of the California Supreme Court on the government funding of abortions. The US Supreme Court said, "You have the right to get an abortion, but it's not unconstitutional for Congress to refuse to fund abortions as part of medical care." However, the California Supreme Court decided the issue

the other way around; they said, "You do have to fund it." The justification for that conclusion began, "Now, we're not saying anything about the morality of abortion, we simply don't take any stance on that. All we're saying is that abortion has to be treated like other forms of child-birth decisions." So I said, "Well, why don't you say, 'We're not saying anything about the morality of abortion, we just feel it has to be treated as the equivalent of other forms of homicide?'" The classification was a moral statement, so it was a sham neutrality.

I used to refer jokingly to myself as the entire right wing of the Critical Legal Studies movement, which in their view was a contradiction in terms. Their critique was purely the instrument of a left-wing political program, which was chosen arbitrarily and presumed to be good. It was a faith commitment.

I picked up the same critique these Marxist law professors were making and turned it against a different set of subjects. My aim always was to demystify the kinds of doctrines the Critical Legal scholars wanted to protect. It never would have occurred to any of them to apply this sort of critique to a case promoting abortion because in their book that was a good thing. So it occurred to me, "Well, this can just as well be used to a different purpose. Let's deconstruct Marx." So that got me into jurisprudence and prompted a skeptical attitude towards rationalism.

I see the fruit of that now, 20 years later, in the first chapter of *The Wedge of Truth*. The young man I wrote about, Philip Wentworth, goes to Harvard, where he learns to keep an "open mind," but all that's really happened is that he's gone with the fashionable crowd and adopted their fashion, as he meant to do from the start. (I recognize so much of myself in that story.)

I became acutely aware that what we think is *reasoning* is very often *rationalization*. When you speak of rationality, there are two very distinct components. One is logical reasoning, which is about going from premises to conclusions, conclusions that should be as good as your premises. Thus, logic will get you into insanity if you've got the wrong premises.

The other component of rationality is having the right premises. How do you get them and how do you determine that they are right? Not by logical reasoning, surely, because then you would be reasoning from other premises in order to justify them. There is an instinct, or revelation, or whatever you want to call it, that underlies your thinking, and the only interesting problem in philosophy is how you get *that*.

After figuring that out, it was the death of rationalism, as far as I was concerned. The problem with rationalism is that it isn't rational. It fails to give sufficient importance to the development of the choice of the right premises; it tries to justify them by circular reasoning. Once I was alert to that distinction, I was able to critique the things that previously I felt I had to take for granted.

***Such as?***

**PJ:** Eventually, the theory of evolution. Remember that my interest was in finding out whether the Christian gospel was rational. Of course, it wasn't rational by the standards of the academic world. One of the good things about the Christian life was that it opened up a whole world of intellectual input that previously had been closed to me. I began to understand what was actually wrong with the academic culture, and to put a name on my uneasiness. It was the

seed of what would later be a full-blown critique of Darwinism. It "evolved" in a directed and purposeful manner!

I am now primarily dealing with people who have incorporated naturalist metaphysics into their definitions of science and reason. I've learned to identify that tendency, and I understand it very empathetically because I lived there for so long. I'm very different from most of the people I associate with now because they grew up in a Christian subculture, whereas my roots are in the academic subculture. I have a different set of experiences and thoughts.

"Where do the givens come from?" was the question I often asked myself. Eventually, that led me to the whole question of the gospel, and the way Jesus deals with people. "Follow me," he said. He gave a new set of premises, a new foundation. One of the very interesting things about Jesus is that when he deals with people, whether they are believers or unbelievers, friends or foes, they are supposed to know who he is. It's perfectly understandable: "I am who I say I am." When you see the truth, when you meet it face to face, you're expected to know it. If you refuse it, you are refusing to see the truth. I found that very fascinating—"How can that be?"

Much later I discovered Lesslie Newbigin, which was like meeting a long-lost twin brother from whom I had been separated at birth. We'd had totally different lives—he was an older man and a missionary—but I recognized in what he was writing the same line of thought that I had independently stumbled upon. Either the gospel of Christ is the centerpiece of a new order or it's nothing. That was so fascinating to me. Then I saw how this was the right principle and starting point. In all of my writing, I concentrate on that starting point. "In the beginning was the Word." A few simple principles. If you stay with those, you'll be all right.

***When you say "the givens," do you mean the revelation that we have in Scripture, or is it something larger than that?***

**PJ:** Something larger. The gospel is not the writing. It's described in the writing, but the Book of Mark isn't "the Way, the Truth, and the Life"—Jesus is. It's apparent in the Christian gospel that he is a living presence with whom you can make contact today. I sometimes say, when speaking in Christian circles, that I'm convinced that Jesus was who he said he was and did what he set out to do, but I'm not always sure that Christianity is a good thing. People erect the structures, which are partly divine in origin and incorporate part of the truth, but they also manufacture part of it and bring cultural influences to it.

***Do you see anything of value in pre-Christian philosophical thinking?***

**PJ:** If you read the Socratic dialogues and some of the things Socrates said, it's really eerie. Socrates says extraordinary things like, "If the perfect man ever lived on earth, you know what they'd do to him? They'd crucify him." Where did that come from?

***From insight?***

**PJ:** Yes. It's the most profound kind of insight at times. The critique of the common understanding of justice, the conspiracy of the weak against the strong in Book Two of *The Republic*, is something I review every year in my classes. It's the most profound analysis of human nature that you can get. On the other hand, there are a lot of dregs in Greek philosophy, too, so I wouldn't swallow it whole.



Humanly speaking, you have to understand all of their ideas in the light of tradition. Nobody should try to think entirely for himself; you learn an enormous amount from what has gone before. That there were other early important Christian thinkers was news to me. I didn't know whom I was reading about when I first encountered the Fathers of the Church because the version of Christianity I knew goes from St. Paul to Augustine to Aquinas and then to Calvin and Luther. So I think it's just wonderful that many Christians are rediscovering the church fathers.

***So as a Christian you moved from philosophical considerations to an attack on Darwinism. Why Darwinism?***

**PJ:** I wanted to know whether the fundamentals of the Christian worldview were fact or fantasy. Darwinism is a logical place to begin because, if Darwinism is true, Christian metaphysics is fantasy. That's why it's so marginalized and is considered to be of no intellectual interest.

***I was surprised last night when someone quoted Darwin as saying, "Well, if we're going to talk about such-and-such, then you may as well ask about the origins of life." Darwin seemed to be putting the origin of life into a separate category of questions he wasn't really addressing.***

**PJ:** Darwin was unsure about the origins of life, but he also made the initial speculation about life evolving in a warm little pond. The whole Darwinist method was immediately extended to include the origin of life. Darwinism is the methodology of philosophical materialism. Maybe *physicalism* would be a better term, given that Darwin didn't develop every last inch of the philosophy.

I got the opportunity when I was on a sabbatical in London in 1987 or 1988 to read more about Darwinism. It was immensely interesting to discover that it's all circular reasoning, deception, and pseudo-science. I had suspected that, but I saw that it was really true. It is a pseudo-science that simply works for confirming examples of a materialist philosophical system that's held up by a priori grids.

***Was there anything you read that "made the light go on," so to speak?***

**PJ:** The first book I read while on sabbatical was Dawkins's *Blind Watchmaker*, which seemed fairly convincing on the first reading but full of holes on the second. Michael Denton's *Evolution: A Theory in Crisis* did much to alert me to the issues.

But perhaps the greatest "Aha!" moment came when I was browsing in a bookstore in London with my wife. Kathie had been a bit skeptical of my developing interest in evolution. (I sometimes get in a little over my head.) She picked up a copy of Isaac Asimov's *Guide to Science*—900 pages of pretty good popular science writing—looked up *evolution*, and there was a brief description of the theory, plus three pages of heavy-handed ad hominem denunciation of creationists for not accepting the absolute truth of this theory that was so obvious to all thinking persons. Then there was a brief section called "Proof of Evolution," in which the entire proof—all the proof that Asimov thought was necessary—was the peppered moth experiment. So Kathie thought about it and said to me, "I think you're on to something." Such experiences have been repeated many times.

The ignorance that's involved, the indifference to the facts, is stunning. Anything that promotes the "Great Darwin" and the materialist understanding is uncritically received, unless it does something that's politically incorrect.

In short, my discovery that the reasoning in Darwinism is unscientific, illogical, and dishonest was tremendously important to me because it validates that "In the beginning was the Word" is really the correct starting point.

I then got to know the people from the main-stream community and the creationist world who are critical of Darwinism. What I brought to the dissident movement—Nancy Pearcey has pointed this out—was a sense of strategy.

People were caught in a rationalist mentality. They were thinking, "If we present facts and evidence, Stephen J. Gould will say, 'Oh yes, you're right and I'm wrong,'" and then the scientists would let them in. Well, I understand a little bit better how that world works, and I thought of it like a political campaign or big case litigation.

So the question is: "How to win?" That's when I began to develop what you now see full-fledged in the "wedge" strategy: "Stick with the most important thing"—the mechanism and the building up of information. Get the Bible and the Book of Genesis out of the debate because you do not want to raise the so-called Bible-science dichotomy. Phrase the argument in such a way that you can get it heard in the secular academy and in a way that tends to unify the religious dissenters. That means concentrating on, "Do you need a Creator to do the creating, or can nature do it on its own?" and refusing to get sidetracked onto other issues, which people are always trying to do. They'll ask, "What do you think of Noah's flood?" or something like that. Never bite on such questions because they'll lead you into a trackless wasteland and you'll never get out of it.

### ***How did others become involved in the "wedge" strategy?***

**PJ:** I met Steve Meyer, who was in England at the time. Through Steve, I got to know the others, who were developing what became the Intelligent Design movement. Michael Denton stayed in my home for three days while he was in the United States. Meyer introduced me to Paul Nelson, and so on. One by one, these people came together.

At that time there was a little funding to pay for people to come to Seattle occasionally for a conference. So they had me speak at one in 1989 to look me over. I soon became the leader of the group.

I also was introduced to Stephen Jay Gould and his scientific people and attended a seminar in the Boston area where I debated him, which gave me more confidence in our work. That was before I published *Darwin on Trial*. Of course, I'm much more knowledgeable now than I was then, but even then I still could hold my own with the kingpin on the other side. The debate was a draw, which was all I needed because a draw was as good as a victory.

Indeed, my philosophy is, when I do a serious debate, to play for a draw because I do not want my opponent and the audience going away saying, "That is one clever lawyer who can make you look like a fool in a debate." I want them to go away saying, "There's more to this than I thought. We ought to do this again." All you have to do is get the right issues on the

table and then you win. You don't have to worry about it, because Darwinism is wrong, and it will self-destruct.

By the time *Darwin on Trial* was published, I had pretty well worked out the strategy I thought would, in time, win this campaign, and I've been able to convince most of the young-earth creationists and the old-earth creationists that this is the right way to proceed.

I had thought that I would be able to persuade the theistic evolutionists, but that was a total failure. It wasn't until I got to know them that I learned how they think. They are guided by the principle that we're not supposed to have any disagreements with the scientific establishment over science. Everything Richard Dawkins says is perfectly right and acceptable up to the moment he says, "And therefore there is no God." If he just didn't say those last words, he would be fine. I discovered that there was a total lack of interest in evidence and in asking scientific questions. When I tried to tell them it wasn't just the "And therefore there is no God" sentence that expressed Dawkins's atheism, but his whole scientific explanation was grounded in it, they were very resentful that I even raised the objection.

***So they see a great gulf fixed between science and personal faith?***

**PJ:** Yes. For them, the enemy is the Christian fundamentalist.

***Well, aren't you their enemy, too?***

**PJ:** When people start bashing fundamentalists, they start out talking about extreme literalists and so on. But the definition is in fact much broader than that. Anybody who thinks God is real in the sense that evolution is real is a fundamentalist. God is a Sunday morning truth or a Bible-study group truth. That's the way the secular world has it. They're willing to tolerate Christian faith among the students and faculty, provided they don't bring it into the classroom and the work world, where we talk about what *really* happened.

Theistic evolutionists are very content with maintaining that arrangement. They think that they could get along well with the secular world if it weren't for those troublemaking fundamentalists—and everybody who makes trouble is a fundamentalist.

I was the biggest troublemaker of all, so I found myself bitterly resented in the Christian academic world. Theistic evolution is the same thing as atheistic evolution with a certain amount of God-talk. They don't see any merit whatsoever in alleging that God left us *some* fingerprints on the evidence.

I should add that some of my close allies, colleagues, and friends are Christian college professors, so it's not as if they're all that way.

***So theistic evolutionists aren't open to discussing Intelligent Design?***

**PJ:** We've tried many times, but I've found that they are even harder to reason with than the atheistic evolutionists. I've been able to get along with the atheistic evolutionists better. It's disappointing.

But aside from that, I would now say that the project of developing a central position, which could unify the Christian world on this issue, has been accomplished. We're on the verge of

success in the project of legitimating this issue in the secular academic realm. I don't know exactly when to say we've been successful. Maybe when we get a serious article about us in *Time* or the *New York Times*. We're still on the margins. We have this conference at Yale, but the Yale faculty aren't really embracing it. We had the conference at Baylor and got very eminent people from the other side to attend, so we're close to success on that front, but we haven't reached it. We have reached success in the unification of people who disagree about a whole lot of other things but agree that the wedge strategy is correct.

***Are you happy with the broadness of the coalition in the sense of including Catholics and Orthodox?***

**PJ:** Very happy. I think Catholic support is very important. A lot of Orthodox are friendly to it, and I also consider the Orthodox to be major players in this. I greatly cherish their support. Our movement is by its very nature ecumenical. One of the reasons why this issue has always been a loser is that it's only been taken up by Protestant fundamentalists. That has to change.

***It's like the stereotype of the Scopes trial all over again.***

**PJ:** That's a large reason for my redefining the issue. The mechanism of the wedge strategy is to make it attractive to Catholics, Orthodox, non-fundamentalist Protestants, observant Jews, and so on. This will be a long fight. Every month we're moving ahead, even when we get a little bit of a setback.

Once you absorb yourself in the issues and understand the way Darwinians think, you know that it's wrong and it's vulnerable, which is why they fight so desperately to maintain their monopoly on the public forum.

***You have said there is no natural explanation for the rise of genetic information. How important is that question in the debate?***

**PJ:** *The Wedge of Truth* is all about those issues. The scientific key is, "No natural processes create genetic information." As soon as we get that out, there's only one way the debate can go because Darwinists aren't going to come up with a mechanism. They'll start out talking about the peppered moth, and when that self-destructs, then they'll say, "Oh, self-organizing systems, or the fourth law of thermodynamics," and other nonsense, which is just covering up ignorance.

Genetic information is *the* issue, but it isn't the final issue. After you make that breakthrough, then you see other ways in which the theory is questionable. Darwinists will say, "Oh, well, maybe the mechanism has some problems, but the "fact of evolution"—common ancestry—is not in question. We distinguish the fact of evolution from the mechanism of evolution."

But that's a bogus distinction because the "fact"—common ancestry—incorporates the mechanism. It's just a matter of "now you see it, now you don't." They are saying the mechanism by which a father and mother give birth to children is the same mechanism by which our "bacterial ancestors" gave birth to human beings. They say it's all a process of natural reproduction and naturally occurring variation in the offspring.

Biologists affiliated with the Intelligent Design movement nail down the distinction by showing that DNA mutations do not create evolution in any significant sense. Instead, they

make birth defects, so the whole thing is false from the get-go. There is no way you can establish that a bacterium is the parent of a complex animal. There is no mechanism to make the change, no historical or fossil evidence that such a change ever occurred, and there's no way to duplicate the process in a lab.

Once you get that in the debate, then we will be poised for a metaphysical and intellectual reversal that is every bit as profound as the one with Copernicus. People will say, "My gosh, we've been completely misled by this fundamental truth of the creation story of our culture. We can no longer understand the world that way."

How do you change the way people regard the authority of science? Get them to think of it as a much more limited thing. Science is very reliable when scientists stick to the kinds of things that can be tested by refutable experiments, but much of what they tell us is outside that. When they have to fake the mechanisms, it becomes a very dubious philosophy. That raises the question of why so many very brilliant people were misled for so long and did such a good job of rationalizing these things.

When the mechanism of Darwinism becomes discredited, it's like a train that's been turned around. You can say, "Well, that's interesting, but the train is still in the same place. The world, Yale, Berkeley, are still there. The *New York Times* is still telling us what to think. So why isn't everything different?" Well, it *is* different, but you can't see it yet. The train is turned in the opposite direction. It's going to start out very slowly, but it's moving on the logical tracks towards something very different, and when we get there, our great-great-grandchildren will see how different things are.

***What are some of the books and writers that were formative influences on you?***

**PJ:** I've told you I had read the popular Christian classics of Lewis and Chesterton and later, Lesslie Newbigin, and admired them. Michael Denton first introduced me to the fundamentals of the skeptical case about Darwinism.

When I think about things, much of what I get comes from my amateur's interest in history, especially military history. I'm always thinking things like, "This is like Napoleon in Moscow. He's taken over the whole country, but he's about to lose his army." The sweep of historical examples, rather than the philosophers, has influenced me.

I'm a great admirer of the literary classics by Chaucer, Shakespeare, Milton, and the Victorian novelists, especially Austen and Trollope. These are writers who help you have a Christian mindset. I think one of the great tragedies is that the loss of Christian faith and the meaning it gives to people's lives makes it impossible for them to really appreciate literature. With a play like *Hamlet*, for example, you have to inhabit the Christian metaphysical rooms to really grasp what the ghost is and understand that marvelous scene in which Hamlet decides not to kill the king while he is saying his prayers.

Those are the formative influences: history and literary classics. I also give a lot of credit to the authors I fought against.

***Who are your heroes?***

**PJ:** C. S. Lewis certainly was an intellectual hero in that Oxford common-room atmosphere of his time, to stand up for what he believed was right. The other reason I find him so overwhelmingly admirable is that when he was discouraged about philosophical issues after he debated Elisabeth Anscombe, he went off and wrote the *Narnia Chronicles*. How could a man like that, with no experience with children, write enduring classics of children's literature? It's one of the most astounding feats of virtuosity in literary history.

My wife is a collector of children's literature—we have 25,000 volumes in our home—so I have a deep appreciation for it, and for the ability to communicate with young people. Many people are urging me to try my hand at that sort of thing but I've never gotten up the nerve. Maybe I will someday.

### ***What's next for Phil Johnson?***

**PJ:** I'm phasing out my direct involvement in the battle over evolution because the next generation is perfectly capable of carrying the ball. Jonathan Wells, Steve Meyer, Mike Behe, and the rest know more than I do and are very capable writers and debaters.

My next project is to provide excellent worldview education for high school and college students. I see this as a fantastic opportunity to send thousands of these young people properly prepared into the best universities and graduate schools, with a mission to speak the truth and change them by prophetic utterance. I love the sense of having opened a young person's mind to truth and reality and knowing that they can do a great work. Nothing is more satisfying than that. If they have a better idea, they will be successful over time in changing the world. That's what I want to be directly involved in.

My colleague John Mark Reynolds and I are working with donors and organizations to design educational programs. We are proud of the Torrey Honors Institute at Biola University. The young people who are here at this conference are so eager to be intellectually empowered and capable of taking on these issues. I think we can teach them how to do that. They will be better educated than the students at secular schools.

I see my work as not just being about a scientific theory—it's about the definitions of knowledge and reality. I see it as empowering this young generation, and I also see it as being inherently ecumenical. That's represented by John Mark being Eastern Orthodox and me being a Presbyterian elder. Wherever I go, whether to a Southern Baptist, Catholic, or Orthodox church, I feel accepted into the Body.

The first thousand years of the Christian faith was the era of the great councils and of unity in the faith. The second millennium was the millennium of the schisms—the great East-West schism, the Reformation, and the splintering of Protestantism—and then the near destruction of the whole thing in the wake of materialism in the nineteenth and twentieth centuries. But I see that ground being recaptured. All those centuries of strife and conflict and hatred—the engine has run down. There are still people who want to keep it going—I've met some of them—but I think the overwhelming sense is that we're tired of that. The third millennium has to be the millennium of reconstitution—from the bottom up. It's about recapturing the sense of the mystical union of the Body of Christ at the grassroots level. I see that happening all the time.

Copyright 2003 the Fellowship of St. James. All rights reserved. International copyright secured.

File Date: 5.15.03

replica breitling breitling replica watches

## **Communiqué Interview: Phillip E. Johnson**

### **Jeff Lawrence**

This article appears in *Communiqué: A Quarterly Journal*, Spring 1999. We have reprinted it here with permission.

*For most of his life, Phil Johnson has been an insider. He graduated from Harvard and the University of Chicago. He worked as a clerk to U.S. Supreme Court Chief Justice Earl Warren. He taught law at "always-in-the-news" Cal-Berkeley. Johnson has experienced much of what you and I can only read about.*

*In the late 80s, however, Johnson found himself on the outside. Gaining an interest in Darwinism while on a sabbatical in England, he began to study the theories surrounding naturalistic evolution. In 1991, he began a controversial venture into the field of science with the publication of *Darwin On Trial*. The book drew great criticism from a scientific community that had long accepted its assertions as true. Johnson's experience in law and as a logician, however, led him to different conclusions. To the chagrin of those who accept naturalism, Johnson has been calling into question naturalistic rationale ever since. While the view from outside the club may leave one excluded at times, it may, in fact, prove to be the more honest perspective.*

**CJ:** How would you summarize the Intelligent Design (ID) movement for those who might be unfamiliar with its basic premise and goals?

**Phil:** The Intelligent Design (ID) movement is attempting to reformulate the whole creation/evolution debate around the most important questions, and the starting point is, as the leading Darwinist Richard Dawkins acknowledges, "Biology is the study of extremely complicated things that look as if they were designed by a creator for a purpose." Every biological organism from the simplest to the most complex is very, very complex. A bacterial cell is a miniature chemical factory that is far beyond the capacity of anything that human beings can design. So, it seems like the starting point is that these things appear to be designed, because that's what they are. Now, the Darwinists that dominate mainstream science have insisted that the appearance of design is an illusion and that natural selection is responsible for it. So, we're asking for the evidence of that. We're asking for something other than bluff and promises to demonstrate that unguided and purposeless material mechanisms can really do work that is beyond the capacity of human software designers and engineers. And we want to focus on that rather than on other questions that tend to distract us from the main point. We don't want to talk about the biblical chronology, the age of the earth, whether or not there is a relationship among living things, and so on. The mainstream scientific community manages to get this whole issue tremendously confused by stating the question as being whether evolution has occurred. Well, evolution then just means any change whatsoever, so of course when it is put that way, well yeah, some change has occurred. So

they say, "Right. There's no god." [laughs] The designing was done by natural selection--wrong. And so what we're really trying to do is get the logic working right. Ask the important questions and examine the answers to those questions to see whether they are true or not, instead of getting off on these confusing sidetracks that has prevented the truth from coming out.

**CJ:** So, would it be fair to say that the goal is to undermine or call into question what has generally been accepted in the scientific community rather than purporting your own answers to all of the questions?

**Phil:** Yes, the starting point is to understand what in the official answers is just dead wrong, because you can't get anywhere until you've made that step. Now, obviously at some time in the future you hope to get to better answers which are actually true, and that's a positive program, but you can't begin to work in that direction until you have an acknowledgement that the existing answers are false. You have to get the questions right before you can even determine the falsity of the answers. So, for the time being, it's primarily a destructive work that's aimed at opening up a closed dogmatic field to new insights.

**CJ:** You alluded to a few of these a moment ago, but what are some false assumptions that Christians often make when discussing science-related issues, and especially in the area of the creation/evolution debate?

**Phil:** The great problem from the Christian viewpoint is that the whole controversy over evolution has traditionally been phrased as a Bible vs. Science issue, and then the question becomes how do you defend the Bible? Or do you defend it? You might just give up and say, "Well we'll treat it as myth," but then if you don't do that, you have to decide what to defend, and you make a defense of the Bible and Biblical authority. Now, the problem with approaching it this way is that in our culture it is understood that science is some objective fact-finding proceeding. And if you are arguing the Bible vs. Science, then people think that you are arguing for blind faith against objectively determined knowledge or experiment. That's the way the press always presents it, and so the argument's over before it even gets started when it is phrased in those terms. What we want to do is to explore the difference between good science and bad science without bringing the Bible into it at all, because that just confuses the issue. So, I want to ask questions like: Does natural selection have the fantastic creative power that's assigned to it? Can it add vast amounts of genetic information that weren't there before? Does it have this creative power, more so than any other human designer? The moment you ask that question, you see, then you open up to scientific investigation what natural selection can and can't do. And you immediately see that there is this huge gap between what natural selection is supposed to be able to do and what it has actually been seen doing, which is practically nothing. That's why the whole field is so crazy. It requires this vast information-building system that just doesn't exist. What natural selection is supposed to be able to do, has to be able to do, and what it has never been seen doing. And of course there is no creative power there at all that's ever been demonstrated. It's just amazing to me when I got into this field that the scientists couldn't see that or couldn't see the importance of it. I found it hard to believe that otherwise intelligent scientists really believed that the micro-evolutionary examples of mutations that could make a bacteria resistant to antibiotics or something really are the same thing as the creative process that created bacteria and human beings in the first place, but they do seem to believe it. And they're totally oblivious to the enormous evolutionary inadequacies. And they go on saying, "Well, we found a fossil" or "we found a dinosaur with feathers," or "apes and humans have 98% of their DNA



in common" or something. So, they'll just find something that is consistent with their picture of the world and then that is just taken to prove it all. It was an enormous shock to me getting into this to see, in fact, how bad the reasoning really is, how illogical the whole scientific field of evolution is and how resistant the scientists are to having any logic brought into it. So I felt like there was a real opportunity for somebody outside of science whose interest was in good logical thinking rather than in promoting any one particular set of solutions, and that's the mission I've been on ever since.

**CJ:** So, your outside perspective coming at the problem from a background in law has been a real benefit to you, while you've also had to deal with the criticism you've taken for not being a scientist?

**Phil:** That's right. It's really within my field. Biologists who spend their lifetimes studying biology will be legitimate authorities, obviously, on the details of what they've learned in that investigation, and an outsider can't really challenge that, but an outsider definitely can challenge their thinking, particularly when it turns out that they believe in what they believe in not because of what they know as biologists, but in spite of what they know as biologists. It's a philosophical movement based on materialism. And they say, "Well, materialism--that's science and that's our philosophy, and you should believe it because we believe it." At this point, you know, they're not entitled to any particular respect because they are not telling you what they know as biological specialists. They're telling you the prejudice that dominates the their field. So, that's a thinking issue, and it's really more within my discipline than it's within theirs.

**CJ:** Let's shift the discussion just a bit. At the bare bones level, what essentials do you believe the Christian must maintain in the question of human origins in order to remain essentially Christian?

**Phil:** Well, the first thing, I guess, is the role of God as our Creator. The evolutionary naturalists have been telling us that you don't need God in the system, you don't need a creator in the system because these purposeless forces can do it all. If they are right on that, then I would tend to think that probably Christianity should be given up as a bad show, considering most of the people that come to believe that that's what they conclude too. If God is an illusion and the Bible's just been wrong about everything, and religious belief is just believing what you want to believe and the facts show you that it didn't happen that way, well then the logical conclusion it seems to me would be not to try to save Christianity but to give it up as a mistake. Now, that's one reason I was so interested in this field. Because, now, on the other hand, if it turns out that the evolutionary theory is what's mistaken, and natural selection has no creative power, and you have this whole scientific culture that has been believing something dead against the evidence because that's something they want to believe, then even without knowing any more about it, I would say that the theistic and Biblical worldview has been tremendously validated. That is to say it's been validated in the sense that you do need a creator after all, but even more, what's been validated is the biblical view that it's a major part of the human project to get rid of the creator; because their deeds were evil, they did not want to honor god as God, and so instead they imagined various forms of idolatry and nature worship of which Darwinian evolution is just the most prevalent modern form. So, at this point, you say that not only has it been revealed that science points to the reality of a creator after all, but the enormously bad and self-deceptive thinking of the Darwinian evolutionist is something straight out of Romans 1. Without going any further than that, I'd say that the biblical worldview has been enormously affirmed. When it comes to questions like "Is it

really important that the Genesis chronology be upheld?" or whatever, I'm more inclined to "hang loose" on that. For one thing, I'm very much opposed to restrictions on considering the evidence, and so it might be very convenient for us theologically if the Genesis chronology is true, and so, for that reason we might want to believe it, but that doesn't mean that the evidence necessarily supports it. If the evidence overwhelmingly says that that chronology is not true, then we can't make it true by wishful thinking. So, my basic inclination is to follow the evidence wherever it leads, and then live with the consequences of that. What has happened so far when we've done that is that the materialistic and naturalistic view that dominates our culture has been shown to be self-deceptive in every way. So I'm inclined to think we can afford to follow that program forward courageously without being afraid of what the facts will show.

**CJ:** How essential would you consider the nature of humanity and the supremacy of humanity over the rest of creation? It is often called the vice-regency of humanity over creation, the idea that the human being is ultimate creation or the final end of the creation process...

**Phil:** Yes, well, that I think is central to Christianity--that the creation was meant to culminate in human beings who are created in the image of God and who are different from everything else. So this is another area in which evolutionary thinking, in so far as it says, "Well, human beings really are just another part of the animal world like any other"--the "third chimpanzee," as the title of one book has it, is profoundly anti-Christian, and again, if it's true, perhaps Christianity should be given up as a bad show. Now it isn't true at all. This is a conclusion that I came to before I really took up Darwinism as such. One of the things I had noticed as a professor of law was how unsuccessful science was at explaining human behavior and the human condition on the basis of material factors or scientific ideas of causation. We saw this in the insanity defense and in the efforts to reform it into a scientific model in which we would have science tell us that crimes and even non-crimes--all human actions--are the product of physical causes. Or, perhaps it's psychological causes in early childhood as in Freudianism, perhaps it's training as in behaviorism, perhaps it's chemical reactions as in modern neuroscientific theories of the brain, but these are all responsible for human action. And whenever you go in this way, you end up in madness very quickly. You actually cannot explain human behavior on the basis of cause and effect relations like that. The law has understood this for centuries--we don't speak of behavior as caused but rather as chosen. The physicalists, you know, scientific materialists tell us you can't have thought determining action because we don't know of any way in which a spiritual or immaterial thing can influence the physical world. Only physical things can influence the physical world. Well, this to me just shows that your philosophy is totally inadequate, because there is nothing we are more directly conscious of than first thinking of something and then acting to bring it about. That's simply true as a matter of our basic direct experience. Any theory that doesn't account for it is a defective theory. So really, the truth about human beings is that they possess free will, the ability to choose between good and evil. They possess an inherent knowledge of the difference between good and evil. This is assumed in criminal law, for example. It's just the truth about what people are. I'd say again, the Christian theistic view of the human condition and its capacities is vastly more realistic than the scientific materialist view. And so, we always have to forget about the scientific materialist view whenever we are going to do any serious work--even scientific work. That's the really hilarious thing about it. If our mental capacities are produced by natural selection or by chemical reactions in the brain, how in the world would we ever have developed the capacity to produce true scientific theories? This has no ability to increase the organism's powers of reproduction so that they could breed more viable descendents or whatever. So the very nature of doing science is based on the view that

it's thought which determines actions, and our thought is not just the product of mechanical forces. There again, I'd say that the Christian theistic view of the human condition and of human action is realistic and consistent with our experience; the scientific materialist view of these things is a fairy tale that even the scientists themselves have to forget whenever they are doing their theorizing. So there is another enormously powerful confirmation of the Christian theistic worldview.

**CJ:** How would you answer the charge that Darwinism is the latest Galileo mistake the church has made?

**Phil:** The first thing is that the Galileo episode has been greatly misunderstood. The idea that there has been a warfare between Christianity and science is an artifact of Darwinist propaganda. They made this story up in the nineteenth century in order to promote their theory and their atheism. But the church has always been the patron of science and of scientific thinking. Now that, of course, has sometimes led to controversies. Galileo got in trouble with the professoriate of his day because he was a cocky, arrogant theorizer who treated everybody else with contempt. He was brilliant, of course, and he was right about important things, but people who've studied the history of the Galileo episodes don't find it too surprising that he eventually got into trouble. Moreover, this all occurred in a particular moment in history when the Catholic church was under enormous pressure because of the spreading Protestant rebellion and when there was a tendency to be very defensive about the Aristotelian philosophy that had come to dominate the church, because that was one of the things that the Protestant church was attacking. So, there were political currents that were unique to that particular time, but more than that, if you want to think of what the College of Cardinals of Galileo's day was like, the analogy today, the equivalent body today, is not the College of Cardinals in Rome, it's the National Academy of Sciences in Washington. See, that's *our* College of Cardinals--the official government and power-wielding leaders of the intellectual world. And they will always crack down on heresy that threatens their position. So, the Darwinists are the College of Cardinals today. They're the ones who are trying to keep their belief system going by censorship and the use of their power. And they're analogous to the Aristotelian professors whom Galileo got in trouble with. In fact, not only has there not been a history of conflict between the churchmen and the scientists, in a way, the problem has been that there hasn't been enough conflict. That is to say, when Darwin propounded his theory, the clergy were so easily intimidated that they gave way right away. There was no battle against Darwinism from the theologians. The battle came from the fossil experts. The theologians were, if anything, too willing to put aside their intelligence and their better judgment because they didn't want to have a conflict with the scientific world and its experts. So the whole history of this has been greatly misunderstood and misrepresented from the Galileo case, which was very atypical, on down to the present.

**CJ:** Much has been said about the impact of our entering the post-modern era. How do you anticipate post-modernism will impact the debate?

**Phil:** Well, It's already having a big effect. The world that I grew up in was one in which a very confident rationalism dominated all of the universities...scientific rationalism, and the thought was that you could have a rationalism in the world of values as well, but now the idea that there are different rationalities has taken hold. I think it's positive, on the whole, in the sense that it focuses attention on assumptions that people make, and there really isn't one single kind of rational system that can combine everything in the world. Then, where it becomes excessive is when it verges over into nihilism or indifference ideas. Post-modernism

is like a whole lot of things: taken in the right doses, it's a healthy antidote to excessive rationalism; taken in overdose, it poisons the mind. But you find the notion that non-Western ways of thinking must be treated with respect, that even ancient traditions of tribes may have their truth value--these are healthy developments, I think, and they help open up the universities to challenges to the dominant scientific materialism. So yeah, it's having a big effect and I think, on the whole, a healthy one.

**CJ:** There seems to be a recent increase of attention given to science and religion by pop culture. For example, the movies "Contact" and "Gattaca" as well as television shows like "The X-Files" have dealt in this arena. How would you characterize that trend?

**Phil:** I thought the movie Contact was absolutely fascinating. It was all over the place--didn't have any clear message. For part of the movie the scientific rationalists are the heroes and the Christians are all terrorists and villains, and then at the end of the movie, it's these same Christian popular movements who believe the scientist Ellie Arroway when the scientific testing has turned her down. So it sends very mixed messages. It's an awfully entertaining movie with lots of ideas shooting off in all directions. Scientific rationalists like Richard Dawkins are tremendously upset at programs like the X-Files because they indicate the degree of popular resistance to adopting a strictly scientific and materialist view of the world. In the university world, there is a very limited dialog of science and religion that's carried on and the ticket of admission to it is that you have to accept Darwinian evolution. So you have these institutions (the Templeton Foundation funded things and all) where the idea is that you are going to have a friendly conversation and it can only be friendly if the religious people accept the scientific frame of reference. So they engage in a certain amount of dialog, particularly with physicists and cosmologists, who are quite open to vaguely religious ideas, not really traditional Christianity, but the physicists tend to be Platonists or pantheists more than hard core materialists, and so they'll engage in these sorts of dialogs. The biologists usually don't place any value on them and are much less likely to be involved, but it's the biologists who call the tune because any person in academic life like myself who's known to be critical of Darwinian evolution will be frozen out of those. The professors at the Christian institutions, or Christian professors at secular institutions, or pantheistic professors don't want to have anything to do with radical criticism of scientific materialism, so accepting the creative power of natural selection against all the evidence is sort of the statement of faith you have to make to be admitted.

**CJ:** How do you think this trickles down to the popular level?

**Phil:** Well, at the popular level there is and there always has been an enormous amount of traditional Christianity that is openly defiant of evolutionary science, for example. It either contradicts it or just ignores it. There is a lot of that. One of the things that is interesting to me is that I'm now getting published quite a bit in journals that are Roman Catholic or Eastern Orthodox. These have become very friendly environments. I've written two pieces recently, and pretty radical ones, for "Commonweal," which is a moderately liberal Catholic organ, and it's a wonderful thing that they are open to this perspective. The Eastern Orthodox tend to be very much in agreement with me, that evolution science is materialistic and atheistic in orientation and that it's not good science. So, at the popular level, outside the universities, I think there is a tremendously healthy revolt against the scientific orthodoxy.

**CJ:** You've said that as a young atheistic academician, you thought Christianity was a dead religion or at least a quickly dying religion, but now you see a resurgence of Christian intellectuals in the universities. Why do you think this transformation has occurred?

**Phil:** Well, the fact is that Christianity is a permanent thing. Fads come and go, but ever since Jesus walked the Earth, there's never been a time when he hasn't been the most important figure in all of Western culture in terms of setting the agenda. Even the Communists had to turn to a liberation theology to theologize their position. What I tend to say is that a couple of centuries from now, you won't hear about Charles Darwin except in courses on British intellectual history, Marx will have been forgotten, Freud will be a footnote to history, but Jesus Christ will still be a prominent part of the culture, and the gospels will still be read and preached. There'll never be a day when everybody believes, but there will never be a time when it isn't alive and active and, really, a trend-setting kind of belief. I think it's just a matter of what is permanently good and true outlasting the faddish ideas we're attracted to in our foolish youth.

**CJ:** Along those lines, what encouragement would you offer to a young student of science--let's say a young lady beginning a Ph.D. program in microbiology at a major university?

**Phil:** We have a wonderful example here in Michael Behe [Associate Professor of Biochemistry, Lehigh University; author of *Darwin's Black Box*] in what he is able to do while retaining a well funded lab and standing in the scientific world and so on. The fact is that there are a lot of people in science who just don't want to be bothered with the whole Darwinian ideological agenda. It doesn't have anything to do with the scientific work that they do, so they are patient with it. I think if we're clever enough in quoting the arguments and keeping people in the conversation and so on, and reassuring them that they can doubt Darwinism and still practice science just as well as ever--that it doesn't mean they are going to give up science and, you know, start thumping bibles instead or whatever--I think there'll just be a growing number of people who will get used to that conversation in that element. Behe has so far been able to maintain his standing, and he's getting invitations everywhere. Once you get someone like that breaks the ice, then there are opportunities for more people. So, I don't think you need to be in despair, but you need to use a lot of tact and judgment and keep your head down while you're getting your Ph.D. in a lot of places--because there is dogmatism, but there are ways to overcome that.

**CJ:** That seems to be the idea behind your concept of driving "the wedge" into the scientific community--that you'd just encourage them to get behind guys like Behe and join that momentum.

**Phil:** Yes, the idea is that you get a few people out promoting a new way of thinking and new ideas, it's very shocking, and they take a lot of abuse. The thing is that you have to have people that talk a lot about the issue and get it up front and take the punishment and take all the abuse, and then you get people used to talking about it. It becomes an issue they are used to hearing about, and you get a few more people and a few more, and then eventually you've legitimated it as a regular part of the academic discussion. And that's my goal: to legitimate the argument over evolution and particularly over the Darwinian mechanism and its supposed creative power, to legitimate that as a mainstream scientific and academic issue. As soon as we can do that and put the spotlight on it, then everybody knows that there is no evidence. So, we can't lose the argument. We're bound to win it. We just have to normalize it, and that takes patience and persistence, and that's what we are applying.

**CJ:** To put a bookend on this, how would you describe your dreams for the Intelligent Design movement? How would you like the movement to be remembered fifty years from now?

**Phil:** Oh, I often say that in 1859, Darwin published the *Origin of Species*. In 1959, there was a very triumphalist celebration of the centennial of its publication at the University of Chicago, and the scientists came from all over and every message was "Darwinian evolution has conquered all, it has defeated Christianity, it has taken over science, it is the wave of the future." I think that in 2059, there will be another vast convention on this subject and the theme will be "How could we ever have let this happen?" When the truth finally comes out, when people understand, I hope we'll be remembered as the pioneers who opened up the criticism and made it possible for the change to occur. It'll take decades for it all to happen, and we won't be around to see the final days, but maybe we'll be remembered as among those who started the ball rolling, and that'll be a great satisfaction.

Works cited:

*Darwin's Black Box : The Biochemical Challenge to Evolution*  
by Michael J. Behe; Free Press, 1996; ISBN: 0684827549

Copyright 1999 *Communiqué: A Quarterly Journal*. All rights reserved. International  
copyright secured.

File Date: 4.7.99

[replica breitling breitling replica watches](#)

**Volume 16, Number 1**

**Darwinism: Science or Naturalistic Philosophy?**

**A debate between William B. Provine and Phillip E. Johnson at Stanford University,  
April 30, 1994**

**PHILLIP JOHNSON:**

This is the fourth time that Will Provine and I have met in debate, the other three times being at Cornell University, two of them in front of his evolutionary biology class. So I feel qualified to say where we will tend to agree and disagree during this debate.

First, where we agree. The modern neo-Darwinian theory of evolution is fundamentally inconsistent with any meaningful theism -- with any meaningful God who acts as creator of the world. Now, of course, this isn't necessarily true of all theories of evolution, or of the concept of evolution broadly construed, because a creator could make use of a gradual, long-term process of making one thing out of another just as well as any other process. So there's nothing about the word "evolution" that rules out the creator.

But the modern neo-Darwinian theory of evolution, orthodox among today's scientists, insists that evolution is an unplanned, undirected process. It combines elements of chance and necessity or natural law, a combination of random genetic changes or mutations, which accumulate through natural selection. These are impersonal material forces reflecting no

preexisting intelligence and no guidance. As the outcome of this process, human beings are essentially unplanned acts of nature.

Now it's evolution in that sense that we're talking about, and evolution as a comprehensive theory of the history of life: how we and other living things came into existence.

The implication of evolutionary biology in that sense is perhaps not exactly that God does not exist. If God does exist, however, existing is about the only thing He has ever done. God is permanently unemployed, if, in the entire history of life, impersonal material forces were capable of doing the whole job, and did do it. So if one attempts to hold a view of God as creator, it is a very attenuated view and one which tends to fade away into unreality.

Thus, a theistic picture of the world is fundamentally inconsistent with the manner of thinking that evolutionary biologists employ to reach their conclusions. Contemporary evolutionary biology, like much else in science, is based on the premise that nature is all there is. This is the premise of metaphysical naturalism. One assumes that at the beginning there was nothing but matter and mindless motion. It follows that impersonal, unintelligent, purposeless forces must have been capable of doing all the work of creation, because there wasn't anything else. Purpose and intelligence could not come into existence until they evolved through unintelligent and purposeless processes.

This way of thinking is said to generate reliable conclusions, which are labeled as "scientific knowledge." Evolution in this sense -- fully naturalistic evolution -- is said to be a fact. Now if that's the way to get to correct conclusions about reality, it would seem likely that the premises supporting the conclusions are true.

Notice the structure of the reasoning. One assumes that no creator was around at the beginning, so material forces had to do everything -- and, it's concluded, mutation and selection did the job. Looking at these conclusions, some people then turn around and baptize the naturalistic account as God's way of creating. Such persons are not thinking logically. They put in at the end of the process what was removed at the beginning.

On the other hand, if we start with the assumption that a Creator exists who might have employed a process of evolution, natural or otherwise, or who might have done something else, then we do not start with any certainty that natural forces alone are sufficient to explain the origin and enormous diversity of life. In short, the person I'll call the "theistic realist" wants to know: Is what you are telling me true? That person will not be satisfied to be told, "Well, the neo-Darwinian story is the best naturalistic story we can tell, and therefore it is science." That's not good enough. We should rather be asking if naturalistic evolution is true at all. Let me give you an example, taken from the exhibit *Life Through Time: A Case For Evolution* (at the California Academy of Sciences Museum in San Francisco), where that question makes a real difference. The centerpiece of *Life Through Time* is the Hard Facts Wall. The wall represents the Cambrian Explosion, the sudden appearance of the animal phyla -- the major divisions of animal life -- in the rocks of the Cambrian era some 550 million years ago, give or take. The Cambrian explosion is one of the great mysteries in the history of life. Richard Dawkins, the complete Darwinist propagandist, says that the phyla are planted there in the rocks as if they had no history at all.

Figure 1 is a diagrammatic representation of the wall. The fossils representing the phyla all lie on parallel lines. These lines, however, are connected by lines with no fossils of their own -- and each connecting point is marked by a magnifying glass.



**Figure 1. Selected Data Applied to Framework.**

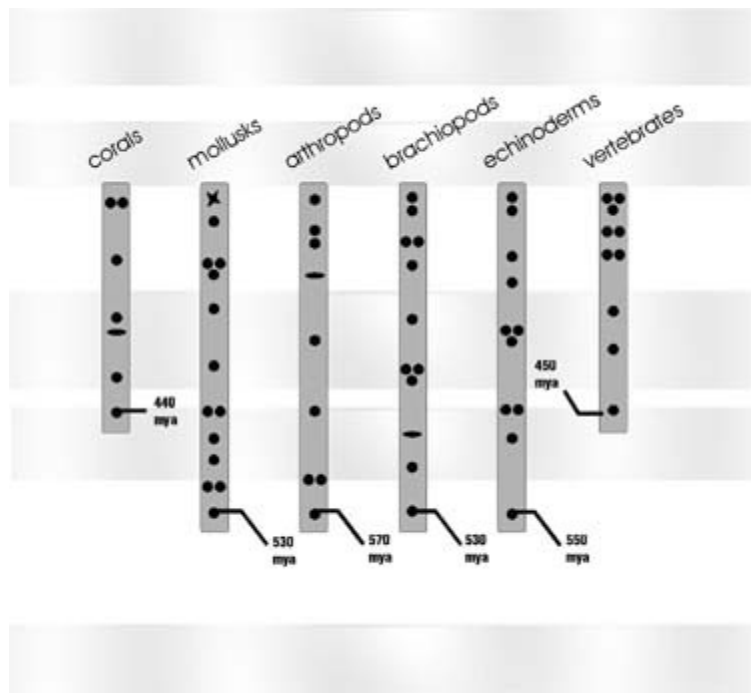
What's the significance of the magnifying glasses? Well, in other parts of the exhibit, magnifying glasses are used to enlarge little fossils -- things that one would have a hard time seeing without the glasses. The implication here is that if you strain your eyes hard enough and look through those glasses, you would see the common ancestors which connect these otherwise disparate phyla.

But there's nothing underneath the magnifying glasses. There is no evidence from the fossils of a pattern of common ancestors and intermediates connecting them. If neo-Darwinism were true, somewhere there should be a universe of transitional intermediates, as Darwin said there had to be. Where is it?

Figure 1 is an empirical plot of the stratigraphic distribution of the fossils, showing the parallel lines of the phyla. Notice what the museum exhibit does with these data. The lines are connected one to another, and the magnifying glasses are placed where the common ancestors should be. The casual museum-goer (I've tested this many times) doesn't see the difference between the parallel lines which represent the evidence, and the connecting lines which represent the theory, or the imagination of the theorist. The exhibit looks as if the common ancestors are really there.

But more than that has been done. Look again at Figure 2.





**Figure 2. Life Through Time: Evidence for Sudden Appearance and Stasis.**

The geological dates don't make any sense. The earliest vertebrate occurs at 450 mya, but on the left-hand side of the figure the earliest coral occurs at 440 mya -- well below in the strata! In terms of the empirical evidence, it makes no sense to alter the time scale that way, but you can see why it's done. The data are tailored to fit the theory.

I wouldn't object if the museum-goer were warned about what is fact, what is theory, and what is speculation. Nothing, however, distinguishes the theory from the evidence.

The actual evidence looks something like this: all of the basic groups arrive at the same time, and, with a certain amount of variation and change within their preexisting boundaries, persist until the present. That's a picture of evolution, of a sort, within certain boundaries. But look at what is predicted by the Darwinian picture. As Stephen Jay Gould describes it, in his fine book *Wonderful Life*, we expect a cone of increasing diversity, where one form branches off into others, the whole range of diversity becoming greater and greater as one goes along. In Figure 1, however, we see the diversity present all at the beginning, with variation within those limits.

Darwinists may be able to accommodate their theory to this evidence. Obviously that would be a long and detailed argument. What I am showing you is that people who are committed to the theory in advance lose sight of the difference between theory and the facts. Hence, they present as indubitable something which is in reality very dubitable, the claim that there was a step-by-step gradual process of natural selection which produced, from much simpler predecessors, the amazingly diverse basic groups of the Cambrian explosion.

It's not just diversity that has to be explained. It's complexity. We have to explain how new genetic information came into the world in order to make complex plants and animals out of single-celled predecessors. Where's the evidence that this happened? Of course, if one is a metaphysical naturalist, starting from the assumption that nature had to do its own creating, then something very much like neo-Darwinian evolution just has to be true as a matter of one's basic assumptions. There can be argument about the details -- the relative role of chance

and natural selection could be at issue, as it is between the neutral theory of molecular evolution and the selectionist alternatives -- but the basic picture just has to be true. One has to explain everything on the basis of a combination of chance events and some natural law that provides the designing force -- something like mutation and selection.

So a metaphysical naturalist can tend to be very uncritical where neo-Darwinism is concerned. Let me give you another example of this, from the autobiography of Francis Crick. Crick is one of the most famous molecular biologists in the world, co-discoverer of DNA, and a passionately atheistic materialist and neo-Darwinist. Crick strongly recommends a book by Richard Dawkins called *The Blind Watchmaker*, which presents the modern argument for the Darwinian mechanism of mutation and selection. Here is what Crick says:

If you doubt the power of natural selection, I urge you for the sake of your soul to read Dawkins's book. I think you will find it a revelation. Dawkins gives a nice argument to show how far the process of evolution can go in the time available to it. He points out that man, by selection, has produced an enormous amount of types of dogs such as Pekingese, bulldogs, and so on, in the space of only a few thousand years. Here man is the important factor in the environment, and it is his peculiar tastes that have produced, by selective breeding, not by design, the freaks of nature we see preserved all around us as domestic dogs. Yet the time required to do this on an evolutionary scale of hundreds of millions of years is extraordinarily short, so we should not be surprised at the ever greater variety of creatures that natural selection has produced on this much larger timescale.

Now that's typical Darwinian reasoning. Selective breeding proves that small-scale change can lead to macro-change, i.e., to new forms of life and new complex organs. All that's needed is enough time.

Yet a child should be able to see that the example is quite beside the point. It's quite beside the point because selective breeding is a purposeful process in which a human breeder pursues a distant goal with skill and persistence. Yet the crucial claim of Darwinian evolution is that unguided processes can do the work of creation. The analogy fails because the processes being described are fundamentally different. Moreover, as is well known, even with all the power of human intelligence and purpose, breeders are able to produce change only within boundaries. Even those dogs are all members of a single biological species. Dogs don't get bigger and bigger indefinitely -- as big as elephants or whales -- much less change into elephants or whales, and the reason is not that there is not enough time. Rather, the genetic variability gives out.

Why have scientists of Crick's caliber overlooked these points? Answer: when you are proving something that just has to be true anyway, almost any evidence will do. For instance, evolutionary biologists trumpeted the minor results of the peppered moth observations around the world. As you know, experiments show that when trees were dark in the Midlands of England, dark moths in a population tended to survive more frequently than light moths, so the percentage of dark moths in the population went up for awhile until the trees became lighter again, and then light moths predominated. These shifting frequencies within a population, in which there were dark and light moths all along, have nothing to do with showing how you can produce moths and trees and birds and scientific observers in the first place. And yet this extremely modest evidence that natural selection produced something was so thrilling to the Darwinian world that it became one of the most famous scientific observations of all time.

What's going on here? Well, frankly, what's going on here is a cultural conflict. Evolutionary science has become a weapon in a cultural war. Countless public television programs, textbooks, and popular treatments foster the illusion that the tools of empirical science have shown the naturalistic worldview to be true.

But that isn't the case at all. The naturalistic worldview was assumed at the beginning. And an extremely lenient standard of evaluating the evidence has been employed, by which one can credit a marvelous creativity to mutation and selection that no one has ever seen, that no one ever will see, and that has not been recorded in the fossil record. That's metaphysics, not empirical science, from the standpoint of one who doesn't take metaphysics for granted.

What's happened is that neo-Darwinian theory -- a theory that is perfectly valid for certain small-scale changes -- has been enlisted in the service of naturalistic philosophy. Minor changes, however, the stuff of neo-Darwinian observation, do not produce new kinds of organisms, and, above all, do not add to the genetic information, which should be the real subject of biological evolution. These problems have been recognized all along by farsighted people in the scientific community, people like Pierre Grassé, the preeminent French zoologist of our time, Richard Goldschmidt, the Berkeley geneticist, even people like Stephen Jay Gould, my sometimes adversary, who perhaps feels somewhat embarrassed that his own attacks on every element of the neo-Darwinian scheme have been quoted to discredit it.

These scientists understand that a theory which is valid only at the small scale has been recklessly extrapolated into a general theory of creation, in order to fill the explanatory gap that would otherwise exist. The theory has to be extrapolated. Otherwise we wouldn't have a theory at all.

This isn't a secret. As the theoretical biologist Stuart Kauffman says, for example, in the introduction to his book *The Origins of Order*, neo-Darwinism has fractures at its foundations, and needs to be replaced or supplemented. It's never quite clear by what -- some new theory based on computer models, or self-organizing systems that may or may not exist in nature.

Once again I am not here to tell you that there is nothing valid in these theories or research programs. But prominent members of the scientific community recognize a crisis. Year after year, people have come forward hoping to find the answer, hoping to find the new and general theory of evolution Stephen Jay Gould said was emerging to fill the gap left by what he called the "effectively dead" neo-Darwinian synthesis.

But no new adequate naturalistic explanation has emerged, and so Gould himself has to scurry back and protect the neo-Darwinian synthesis because there is no alternative. There would be a cultural earthquake if the scientific community had to admit a mistake, and had to acknowledge that they really don't know the answers to questions they have confidently told the public they did know the answers to.

It is possible to recognize this, however, and to debate it in an academic forum. I hope we are going to be doing a lot more of that in the near future. Biologists cannot be allowed to tell the creation story of our culture without dissent from the rest of us.

**WILLIAM PROVIN:**

Did you notice that Phil had nothing to say about his mechanisms of evolution?

I think it's wonderful that we are having a debate of this sort. It's really good for Stanford, and good for people to get these views out in the open. Phil is definitely a friend of mine, and that's something you need to understand. We get up here, argue like everything, and then have dinner and a beer together afterwards.

But, having said that, let's look again at Phil's views. Phil is a born-again Christian. He believes that God exists, that God created life, and, apparently, successively created the major forms of life. God's design is apparent in the adaptations of animals and plants. God created humans separately because humans and chimpanzees do not share a common ancestor. God gives us life after death, and God gives us an absolute foundation for ethics. God gives us ultimate meaning for life, God gives humans free will, and thus, the possibility of genuine understanding and responsibility.

When it comes to the important questions, Phil has a very clear maxim, which is maximize your leaps of faith. Get them as big as you possibly can. Will has a maxim too: minimize your leaps of faith. That way you can actually live in a natural world.

It's strange. When Charles Darwin was a young man, he believed all the things that Phil believes now, with the exception of being born again. What could have caused a smart fellow like Charles Darwin -- and by the way, I don't claim that Darwin was all that smart; I believe that Phil Johnson is much smarter than Darwin, who, had he gone to Harvard, would have graduated near the bottom of his class -- to have changed his views? But he did change his mind, and we're going to have to figure out why.

He had a number of very direct reasons. First, morphological similarity among organisms suggested shared descent. Just plain morphological similarities. Secondly, living species are similar to recent related fossils. Now this is an issue that Phil does not work on very much. Indeed, the recent fossil record is quite good, and we can look in the fossil record and can see relatives of clearly different species that exist in the fossil record, and are closely related, however, to living species. Darwin saw this when he was on the voyage of the Beagle, different species occupying the same ecological niches in different but connected geological areas. As Darwin went down the east coast of South America, up the other coast, and around the world, he noticed that in similar ecological niches there were related but different species. Finally, of course, there was the similarity of island species to related species on nearby mainlands.

Darwin invented natural selection only after he had come up with the idea of evolution by descent, and that occurred only after the voyage of the Beagle. He believed that inventing the idea of natural selection was like committing murder. He knew exactly what he was doing. He was murdering the cultural tradition in which he had been raised, and in which Phil continues to live (rather belatedly).

How about natural selection and selection under domestication? Phil really whangs on poor Darwin for this one, but Darwin observed, for example, more than five hundred varieties of domestic pigeons, from pouters to giant homers. If you know pigeons at all, pouters are really different from giant homers. He realized that natural selection could produce even greater change operating on the same available heritable variation. For Darwin, and for his readers who took the idea seriously, natural selection undermined the argument from design. If you accept the argument of natural selection, then of course you cannot see intelligent design even in butterflies, or apes, or pandas, or whatever the pandas eat. Darwin gradually came to

understand that the implications of his conception of evolution were profound. While difficult for him to accept, the implications were finally impossible for him to reject. Let's see what they are.

First, the argument from design failed. There is no intelligent design in the natural world. When mammals die, they are really and truly dead. No ultimate foundations for ethics exist, no ultimate meaning in life exists, and free will is merely a human myth. These are all conclusions to which Darwin came quite clearly. Modern evolutionary biology not only supports Darwin's belief in evolution by descent, and his belief in natural selection, but all of the implications that Darwin saw in evolution have been strongly supported by modern evolutionary biology.

Modern evolutionary biology has a great deal more evidence for evolution by descent than Darwin had. For example, we now have a lot of molecular evidence for descent. When we sequence DNA, and look at the differences between two apparently related but different organisms, we can see to what extent they share DNA. When you do this for humans and chimpanzees, by a variety of different techniques, and by using different parts of the genome, you can see that they share some ninety-nine percent of their genomes.

And domestic breeding has had tremendous success in the twentieth century. Observations of natural selection in the wild have been carried out in large part since 1950, but they occupy a good part of evolutionary biology today. Plate tectonics has shown us a lot about the movement of plates on the earth's surface, but it also has helped us to understand the geographical distribution of animals and plants, both living and fossil, and the correlation between what we understand of plate movement and what we can see of both fossil and living forms.

This is very strong evidence for evolution by shared descent. We know a great deal more now about fossil formation, which basically supports most of what Darwin believed, and we have a great deal more fossil evidence.

I will have to introduce Phil's bull at this point. I really appreciate Phil's general point of view. I used to share it myself -- Phil is a Presbyterian, and I used to be one -- and I'll say something more about that in just a few minutes.

OK, this is Phil's bull. Now I'm not going to make that bull appear again, unless Phil says something that is bull. Bye-bye, bull. We'll see you later, if we need you.

Let's look at Phil on artificial and natural selection. He just told you that artificial selection has definite limits on the amount of variation of even the most highly skilled breeders can achieve. Dogs do not change into elephants because dogs do not have the genetic capacity for that degree of change, and they stop getting bigger when the limit is reached. I suppose the limit is reached now. Well, let's see. Phil, there's the bull!

Let's see how far artificial selection can go. Breeders do, in fact, run out of heritable variations from time to time, but recombination and mutation mean that the limits that Phil claims simply don't exist. Let's look at some of the evidence for this, from long continued selection experiments. The oil and protein content of corn have been going up since the turn of the century. No limits have been reached: both protein and oil are still going right ahead.

What about chickens? I grew up on a chicken farm. Chickens are getting more and more diverse. They are laying more and more eggs now than when I was a kid. The ratio of fat content to lean in hogs, coat colors in fancy mice -- just go to an animal or plant breeding book, and you'll find lots of examples. Take the example of dogs. We can get Chihuahuas and St. Bernards out of wild wolves in just a few thousand years. But Phil wants us to believe that we can't go any farther. Sure, we can go farther than that. We can make dogs the size of rats and buffalo. It wouldn't even take a few million years. I suspect it would only take a few tens of thousands of years. Not only that, they would be what we call "species" -- different species indeed.

Where did Phil get the information that artificial selection just comes to an end, that there are limits to the size to which dogs can be selected to be? I don't know how he knows what the limits are. Animal and plant breeders certainly have not found them.

Next to Phil on natural selection. Hey, he believes in evolution! He even tells you. He'll give you Hawaiian *Drosophila* as a case of evolution by naturalistic causes. He says there is no reason for believing that natural selection can produce new species, new organs, or other major changes or even minor changes that are pertinent. So let's look at Hawaiian *Drosophila*. The older and newer species of Hawaiian *Drosophila* differ in major morphology, head shape and size, internal organs. They most certainly deserve to be called different species. More than twenty million generations separate some of these, and when you do DNA-DNA hybridization, or you sequence genomes and compare them, the genetic distances are quite large.

So you've got a problem. You admit that the differences between Hawaiian *Drosophila* species have evolved by natural means. You deny that humans and chimpanzees share common ancestors. But the fact is that the morphological and genetic differences between old and new Hawaiian *Drosophilas* is far greater than the differences between humans and chimps. So what should you do, Phil? In the future you've got to argue that God created different species of Hawaiian *Drosophila* -- otherwise you are going to be inconsistent.

Evolution of highly adapted things is really tough, and Phil says that you can't get the evolution of a wing for the following reason. Limbs evolving into wings would probably be awkward for climbing or grasping long before they became very useful for gliding, thus placing the hypothetical intermediate creature at a serious disadvantage. I have a feeling that the bull is coming! Bull!

There are organisms that glide, and they don't lose the ability of their limbs to climb or to jump. A lot of flying squirrels -- we raise a great number of them -- fly like crazy, they can also jump and grasp onto trees very well. Incidentally, these species separated from the regular gray tree squirrel about thirty-five million years ago. So when creationists tell me that a flying squirrel is one of God's kind that belongs to the squirrels, I return by saying, "Gosh! You know humans and chimpanzees share a common ancestor five to seven million years ago, and these squirrels that you say are all one of God's kind shared a common ancestor about thirty-five million years ago!"

Consider extinction and natural selection. When thinking about adaptations being the work of intelligent design, we should ask: are these the very same adaptations which virtually guarantee extinction when the environment changes enough? If you go back only sixty-five to seventy million years ago, to the end of the Cretaceous, the general estimate is that there were

about fifty thousand species of vertebrates. Of those, fewer than twenty give rise to the some one hundred thousand species of vertebrates that exist now. All the rest went extinct.

On the theory of intelligently designed adaptations, the intelligent designer clearly is very short-sighted indeed. Virtually all of his creations are extinct. All the species on earth are going to be gone in one billion years, and the sad thing about that is that life has been around for three and one-half billion years already, so it's only got a relatively short period of time. Phil and I have already lived more than half of our lives. Life on earth faces the same dismal prospect.

When you die, you're not going to be surprised, because you're going to be completely dead. Now if find myself aware after I'm dead, I'm going to be really surprised! But at least I'm going to go to hell, where I won't have all of those grinning preachers from Sunday morning listening.

Let me summarize my views on what modern evolutionary biology tells us loud and clear -- and these are basically Darwin's views. There are no gods, no purposes, and no goal-directed forces of any kind. There is no life after death. When I die, I am absolutely certain that I am going to be dead. That's the end of me. There is no ultimate foundation for ethics, no ultimate meaning in life, and no free will for humans, either. What an unintelligible idea.

Christian humanism has a great deal going for it. It's warm and kindly in many ways. That's the good part. The bad part is that you have to suspend your rational mind. That part is really nasty. Atheistic humanism has the advantage of fitting natural minds trying to understand the world, but the disadvantage of very little cultural heritage -- and that's a real problem.

So the question is, can atheistic humanism offer us very much? Sure. It can give you intellectual satisfaction. I'm a heck of a lot more intellectually satisfied now that I don't have to cling to the fairy tale that I believed when I was a kid. Life may have no ultimate meaning, but I sure think it can have lots of proximate meaning. Free will is not hard to give up, because it's a horribly destructive idea to our society. Free will is what we use as an excuse to treat people like pieces of crap when they do something wrong in our society. We say to the person, "you did something wrong out of your free will, and therefore we have the justification for revenge all over your behind." We put people in prison, turning them into lousier individuals than they ever were. This horrible system is based upon this idea of free will.

Since we know that we are not going to live after we die, there is no reward for suffering in this world. You live and you die. I've seen bumper stickers (very sexist ones, actually) that say "Life's a bitch, and then you die." Well, whatever life is, you're going to die. So if you're going to make things better for yourself or for those you care about, you had better become an activist while you're still alive.

Finally, there is no reason whatsoever that ethics can't be robust, even if there is no ultimate foundations for ethics. If you're an atheist and know you're going to die, what really counts is friendship -- and that's why I value Phil's friendship so much.

## **MODERATOR:**

Now we turn to the rebuttal. Professor Johnson will begin.

## PHILLIP JOHNSON:

Will was kind enough to say flattering things about my intelligence, so I want to be sure and return the compliment. Will Provine has one of the great minds of the nineteenth century. What you have just heard is the mechanistic, atheistic village rationalism which says if we can just understand that we are simply mindless machines which need fixing -- and if we stop treating people as independent human agents created by God -- then we can solve all of our problems. We'll have this "scientific" approach.

I used to be an atheist. Charles Darwin used to be a theist, of a kind. He was, perhaps, a weak deist. But I was an agnostic, and when people ask me why I'm not an agnostic anymore, I say that I could not manage the leaps of faith that were required.

One of the necessary leaps of faith holds that single-celled creatures have the capacity, by a combination of random changes and natural selection, to turn into complex plants and animals, even though there isn't any evidence for this. You have to believe that the fossil record is totally misleading, and that a theory that contradicts it in every way is reliable. After hearing Will's theory about how Darwinian theory explains extinctions, I want to bring out that bull myself. In fact, extinction is one of the many ways in which Darwinian theories have been thoroughly discredited. In his recent book on extinction, Professor David Raup of the University of Chicago points out that it is only Darwinian theory and its prejudice that made biologists and fossil experts pursue for so long the illusion that things gradually become extinct because they are supplanted by better adapted descendants. Rather, there has been a return to catastrophism in extinctions, which is totally contrary to the uniformitarian predictions and predilections of Darwinism.

I want to get to a more fundamental, important level. Will, you may have noticed, talked a lot about variation. That is the Darwinian way of explanation. We get little changes, and little changes could conceivably become big changes (even if they're not recorded that way in the fossil record), and so what is to prevent little changes from adding up into big changes?

It's not so much that this is the wrong answer. It's the wrong way of looking at the problem. That is, it's the wrong question. The important thing about organisms is the information that they contain, encoding complex interrelated mechanisms that all have to exist and operate together in an extremely complicated way.

You couldn't make a computer program by sending random jolts of electricity through a magnetic field, even though computer programs, and computers, employ electricity and magnetism. Analogously, when we come to explain the origin of organisms, we don't really need to know how they vary or function once they exist, but rather how the very genetic information making the organism possible itself came to be. This is the problem that has been systematically ignored by Darwinian biology, although it's beginning to come into prominence now with the work of the complexity theorists.

When you understand that the problem is the original information -- the foundational complexity -- then you realize that research such as, for example, the growth of molecular evolution studies, is very anti-Darwinian. It's true that by comparing molecular sequences you can make what are called molecular phylogenies. Exactly what those phylogenies mean is very much in dispute, because they are often different for different molecules, and the data are very heavily and carefully interpreted -- but some patterns of relationship exist.



What the molecular studies also show us, however, is that the complexity which we have always seen at the visible level in organisms is replicated at the molecular level. We see deep new levels of complexity, so that even the simplest form of vision, for example, requires a vast network of complicated molecular components that all have to work together to set it in motion.

No effort is being made to solve these problems. In practice, molecular evolution studies chart molecular relationships. They do not explain how the complex varieties of molecular systems first came about. And the problem just gets more and more difficult all the time.

Will talked about recent fossils and how things are related. Yes, you can make a pattern of relationships, and say that some things are more like certain things than like others. But where are the patterns of ancestors and ancestral descent? Where is the step-by-step progression from one thing to another, especially in the big divisions, the phyla of the Hard Facts Wall? Where it ought to exist that pattern is totally absent.

Neo-Darwinism is really a theory of variation within types which already exist. That modest theory is extrapolated, however, into a general account of biological creation and innovation. This is not a criticism which I have invented out of some religious bias. The most sophisticated Darwinists have seen it all along. It's what Stephen Jay Gould said when he wrote in 1980 that the synthesis as a theory is generally dead, despite its prevalent textbook orthodoxy.

Neo-Darwinism doesn't fit the evidence. Evolutionary change doesn't seem to occur in that way. The evidence that mutations of a complexity-building type arrived regularly and in great quantity, on schedule, to build new complex organs, just isn't there. That's why the stories of wing evolution and so on are called, derisively, "just-so" stories. They are naturalistic fables in scientific language, but without the scientific backing to show that they really happened.

Again, my goal in a talk like this isn't convincing people in the audience who may be convinced of the opposing view to change their minds overnight. I don't think that's how people are persuaded. What I want to convince you of is this. Those who doubt the truths of Darwinian evolution, who doubt that the accumulation of micro-mutations through natural selection builds complex plants and animals from single-celled predecessors, who doubt that anybody knows how the specific human qualities of consciousness and intelligent purpose have arisen -- these are people who doubt for scientific reasons based on the evidence.

What has been going on for the past century or so is a steamroller. You get the tone of the steamroller in the way that Will argues, friendly though he is. The purpose is to overwhelm dissent. And I want you to understand that that won't work anymore. As some of the most farsighted people in the field have grasped, the problems aren't going away. If anything, they've grown worse. We're going to have to come to grips with this, and I believe that as soon as we can get the debate open in the universities, and out on the table, the kind of evolution that Will Provine is preaching is going to collapse. Not because people like me are going to do it, but because the scientists themselves will see that they can't go on with it. Over to you.

**WILLIAM PROVIN:**

Phil argues that evolutionary biology is in a crisis. There is no crisis whatsoever in the field of evolutionary biology with regard to the question of evolution by descent. Evolution by descent is agreed upon everywhere, among both biologists in general and certainly by evolutionary biologists in particular. You simply see no dissent there whatsoever.

But Phil conflates evolution by descent with the mechanisms of the evolutionary process. Darwin believed they were separable issues. I believe they are quite separable as well. There is very strong evidence indeed for evolution by descent. This does not mean that there is a complete fossil record. But what we can look at is the evidence we do have, and make the very reasonable conclusion that the entire process was evolution by descent, leaving aside whether it's purposeless or guided by God.

The question comes down to naturalism versus supernaturalism. I started from supernaturalism. I studied modern science, and that's what turned me into a naturalist. It's not as if I didn't fully consider the problem of supernaturalism. I clung to supernaturalism because I wanted it to be true. But in studying evolutionary biology, I found I simply couldn't hold to my belief because the evidences for naturalism were too great.

So, for me, the size of the leap of faith that is required to believe in naturalism is small. Phil tells you it's very large indeed. I guess for him it's only a small leap of faith to believe in a benevolent God who answers prayers, and who gives us all these other things. And that's just a little leap of faith! To me that's a giant leap of faith compared with believing in naturalism.

I would like to hear from this audience, on the count of three, how many of you believe all animals and plants were created by God within the last ten thousand years. All right, now from those who believe evolution occurred over very long time periods, but God guided this process. It seems, from the show of hands, that evolutionary theists are few and far between. Lastly, who in this audience believes that evolution occurred over three and one-half billion years ago by totally natural processes? The young earth creationists win that poll.

I thought I would discuss Phil's views on mechanisms of evolution, but unfortunately he said not one word about it, and if you ask him questions about it, that's exactly what you'll get in response: blank, blank, blank.

I thought Phil's critique of the California Science Museum exhibit was terrific. Only he just didn't go far enough, because many of those exhibits are much worse than he knows. I went through the one at the Royal Ontario Museum and that showed the mollusks evolving only once, and the exhibit showed a bunch of modern mollusks. Well, the mollusk expert I know the best, Arthur J. King from the University of Liverpool, claims that he's got abundant morphological evidence showing that mollusks have evolved independently at least five times around the world. So the exhibit was horrible. Shall we conclude that, because the museum exhibits are poor, evolution has not occurred? I don't think that follows.

Phil also argues that we cannot conceive of a natural process that can produce both diversity and adaptations. It seems to be clear that, indeed, natural selection can account for adaptations because Phil believes the Hawaiian *Drosophila* evolved through naturalistic processes. In those seven-hundred some odd species of *Drosophila* there are some of the most exquisite adaptations you would ever lay your eyes upon or understand. Indeed, they are jammed with adaptations. And so Phil obviously believes that natural selection can produce exquisite

adaptations. The question is only whether it can do so over long periods of time. It seems to me that it's a leap of faith to believe that natural selection can, but it's a little bitty leap.

I even have faith that it's going to get light tomorrow morning. That is nothing but pure faith, but it's a little, bitty leap of faith. We have to keep in mind the sizes of leaps of faith.

Phil says that the evolutionists are uncritical. But Phil's view leads, I suppose -- he doesn't talk about it very much -- to the argument that God created the major adaptations in animals and plants. Now, how uncritical is that? A God comes down here to earth every once in a while, makes a few species of this and a few species of that -- and makes humans independently of any shared common ancestor with chimpanzees. Notice that he doesn't talk about that in his rebuttal. Maybe some of you would like to ask him that question.

As far as artificial selection is concerned, the point is that artificial selection is effective, not that it's purposeless. Over long periods of time, natural selection is sure to be more powerful than artificial selection, because it can "see" more of the organism that we ever could.

Evolutionary science is a weapon in a cultural war? I didn't know I was at war! Are we at war, Phil? That's all folks, and thank you.

Copyright © 1995 Access Research Network. All rights reserved. International copyright secured.

File Date: 6.02.95

<http://www.arn.org/infopage/johnson.htm>

<http://www.arn.org/arnproducts/audinfo.htm>



### **Meet Phil Johnson**

Does this guy look like a lawyer or what? You're right. This is Phillip E. Johnson, Professor of Law at the University of California, Berkeley (otherwise known as "Phil" to his friends at ARN).

Phil has been stirring up the pea patch in respectable scientific circles by insisting that neo-Darwinism is naturalistic philosophy and not science. We like Phil so much we produced four video tapes of his lectures, interviews and debates, offer seven of his audio

cassette lectures, and carry his books. We have also set up a home page containing an array of articles and resources about Phil. Be sure to read his debate with William Provine elsewhere on this server.

Send mail to Phil Johnson: [philjohn@uclink.berkeley.edu](mailto:philjohn@uclink.berkeley.edu)

## **Evolution as Dogma: The Establishment of Naturalism**

### **Responses of Critics to Phillip Johnson**

#### **Phillip E. Johnson, "A Reply to My Critics"**

### **Phillip E. Johnson**

The orthodox explanation of what is wrong with creationism goes something like this:

Science has accumulated overwhelming evidence for evolution. Although there are controversies among scientists regarding the precise mechanism of evolution, and Darwin's particular theory of natural selection may have to be modified or at least supplemented, there is no doubt whatsoever about the *fact* of evolution. All of today's living organisms including humans are the product of descent with modification from common ancestors, and ultimately in all likelihood from a single microorganism that itself evolved from nonliving chemicals. The only persons who reject the fact of evolution are biblical fundamentalists, who say that each species was separately created by God about 6,000 years ago, and that all the fossils are the products of Noah's Flood. The fundamentalists claim to be able to make a scientific case for their position, but "scientific creationism" is a contradiction in terms. Creation is inherently a religious doctrine, and there is no scientific evidence for it. This does not mean that science and religion are necessarily incompatible, because science limits itself to facts, hypotheses, and theories and does not intrude into questions of value, such as whether the universe or mankind has a purpose. Reasonable persons need have no fear that scientific *knowledge* conflicts with religious *belief*.

Like many other official stories, the preceding description contains just enough truth to mislead persuasively. In fact, there is a great deal more to the creation-evolution controversy than meets the eye, or rather than meets the carefully cultivated media stereotype of "creationists" as Bible-quoting know-nothings who refuse to face up to the scientific evidence. The creationists may be wrong about many things, but they have at least one very important point to argue, a point that has been thoroughly obscured by all the attention paid to Noah's Flood and other side issues. What the science educators propose to teach as "evolution," and label as fact, is based not upon any incontrovertible empirical evidence, but upon a highly controversial philosophical presupposition. The controversy over evolution is therefore not going to go away as people become better educated on the subject. On the contrary, the more people learn about the philosophical content of what scientists are calling the "fact of evolution," the less they are going to like it.

To understand why this is so, we have to define the issue properly, which means that we will have to redefine some terms. Nobody doubts that evolution occurs, in the narrow sense that certain changes happen naturally. The most famous piece of evidence for Darwinism is a study of an English peppered-moth population consisting of both dark- and light-colored

moths. When industrial smoke darkened the trees, the percentage of dark moths increased, due to their relative advantage in hiding from predators. When the air pollution was reduced, the trees became lighter and more light moths survived. Both colors were present throughout, and so no new characteristics emerged, but the percentage of dark moths in the population went up and down as changing conditions affected their relative ability to survive and produce offspring.

Examples of this kind allow Darwinists to assert as beyond question that "evolution is a fact," and that natural selection is an important directing force in evolution. If they mean only that evolution of a sort has been known to occur, and that natural selection has observable effects upon the distribution of characteristics in a population, then there really is nothing to dispute. The important claim of "evolution," however, is not that limited changes occur in populations due to differences in survival rates. It is that we can extrapolate from the very modest amount of evolution that can actually be observed to a grand theory that explains how moths, trees, and scientific observers came to exist in the first place.

Orthodox science insists that we can make the extrapolation. The "neoDarwinian synthesis" (hereafter Darwinism) begins with the assumption that small random genetic changes (mutations) occasionally have positive survival value. Organisms possessing these favorable variations should have a relative advantage in survival and reproduction, and they will tend to pass their characteristics on to their descendants. By differential survival a favorable characteristic spreads through a population, and the population becomes different from what it was. If sufficient favorable mutations show up when and where they are needed, and if natural selection allows them to accumulate in a population then it is conceivable that by tiny steps over vast amounts of time a bacterial ancestor might produce descendants as complex and varied as trees, moths, and human beings.

That is only a rough description of the theory, of course, and there are all sorts of arguments about the details. Some Darwinists, such as Harvard Professor Steven Jay Gould, say that new mechanisms are about to be discovered that will produce a more complicated theory, in which strictly Darwinian selection of individual organisms will play a reduced role. There is also a continuing debate about whether it is necessary to "decouple macroevolution from microevolution." Some experts do not believe that major changes and the appearance of new forms (i.e., macroevolution) can be explained as the products of an accumulation of tiny mutations through natural selection of individual organisms (microevolution). If classical Darwinism isn't the explanation for macroevolution, however, there is only speculation as to what sort of alternative mechanisms might have been responsible. In science, as in other fields, you can't beat something with nothing, and so the Darwinist paradigm remains in place.

For all the controversies over these issues, however, there is a basic philosophical point on which the evolutionary biologists all agree. Some say new mechanisms have to be introduced and others say the old mechanisms are adequate, but nobody with a reputation to lose proposes to invoke a supernatural creator or a mystical "life force" to help out with the difficulties. The theory in question is a theory of *naturalistic* evolution, which means that it absolutely rules out any miraculous or supernatural intervention at any point. Everything is conclusively presumed to have happened through purely material mechanisms that are in principle accessible to scientific investigation, whether they have yet been discovered or not.

That there is a controversy over how macroevolution could have occurred is largely due to the increasing awareness in scientific circles that the fossil evidence is very difficult to reconcile with the Darwinist scenario. If all living species descended from common ancestors by an accumulation of tiny steps, then there once must have existed a veritable universe of transitional intermediate forms linking the vastly different organisms of today (e.g., moths, trees, and humans) with their hypothetical common ancestors. From Darwin's time to the present, paleontologists have hoped to find the ancestors and transitional intermediates and trace the course of macroevolution. Despite claims of success in some areas, however, the results have been on the whole disappointing. That the fossil record is in important respects hostile to a Darwinist interpretation has long been known to insiders as the "trade secret of paleontology," and the secret is now coming out in the open. New forms of life tend to be fully formed at their first appearance as fossils in the rocks. If these new forms actually evolved in gradual steps from pre-existing forms, as Darwinist science insists, the numerous intermediate forms that once must have existed have not been preserved.

To illustrate the fossil problem, here is what a particularly vigorous advocate of Darwinism, Oxford Zoology Professor (and popular author) Richard Dawkins, says in *The Blind Watchmaker* about the "Cambrian explosion," i.e., the apparently sudden appearance of the major animal forms at the beginning of the Cambrian era:

The Cambrian strata of rocks, vintage about 600 million years, are the oldest ones in which we find most of the major invertebrate groups. And we find many of them in an advanced state of evolution, the very first time they appear. It is as though they were just planted there, without any evolutionary history. Needless to say, this appearance of sudden planting has delighted creationists. Evolutionists of all stripes believe, however, that this really does represent a very large gap in the fossil record, a gap that is simply due to the fact that, for some reason, very few fossils have lasted from periods before about 600 million years ago.

The "appearance of sudden planting" in this important instance is not exceptional. There is a general pattern in the fossil record of sudden appearance of new forms followed by "stasis" (i.e., absence of basic evolutionary change). The fossil evidence in Darwin's time was so discouraging to his theory that he ruefully conceded: "Nature may almost be said to have guarded against the frequent discovery of her transitional or linking forms." Leading contemporary paleontologists such as David Raup and Niles Eldredge say that the fossil problem is as serious now as it was then, despite the most determined efforts of scientists to find the missing links. This situation (along with other problems I am passing over) explains why many scientist would dearly love to confirm the existence of natural mechanisms that can produce basically new forms of life from earlier and simpler organisms without going through all the hypothetical intermediate steps that classical Darwinism requires.

Some readers may wonder why the scientists won't admit that there are mysteries beyond our comprehension, and that one of them may be how those complex animal groups could have evolved directly from pre-existing bacteria and algae without leaving any evidence of the transition. The reason that such an admission is out of the question is that it would open the door to creationism, which in this context means not simply biblical fundamentalism, but any invocation of a creative intelligence or purpose outside the natural order. Scientists committed to philosophical naturalism do not claim to have found the precise answer to every problem, but they characteristically insist that they have the important problems sufficiently well in

hand that they can narrow the field of possibilities to a set of naturalistic alternatives. Absent that insistence, they would have to concede that their commitment to naturalism is based upon faith rather than proof. Such a concession could be exploited by promoters of rival sources of knowledge, such as philosophy and religion, who would be quick to point out that faith in naturalism is no more "scientific" (i.e. empirically based) than any other kind of faith.

Immediately after the passage above about the Cambrian explosion, Dawkins adds the remark that, whatever their disagreements about the tempo and mechanism of evolution, scientific evolutionists all "despise" the creationists who take delight in pointing out the absence of fossil transitional intermediates. That word "despise" is well chosen. Darwinists do not regard creationist as sincere doubters but as dishonest propagandists, persons who probably only pretend to disbelieve what they must know in their hearts to be the truth of naturalistic evolution. The greater their apparent intelligence and education, the greater their fault in refusing to acknowledge the truth that is staring them in the face. These are "dark times," Dawkins noted last year in the *New York Times*, because nearly half of the American people, including many who should know better, "refuse to believe in evolution. That such people have any rational basis for their skepticism is out of the question, of course, and Dawkins tells us exactly what to think of them: "It is absolutely safe to say that if you meet somebody who claims not to believe in evolution, that person is ignorant, stupid, or insane (or wicked, but I'd rather not consider that)."

Darwinists disagree with creationists as a matter of definition, of course, but the degree of contempt that they express for creation in principle requires some explanation beyond the fact that certain creationists have used unfair tactics such as quoting scientists out of context. It is not just the particular things that creationists do that infuriate the Darwinists; the creationists' very existence is infuriating. To understand why this is so, we must understand the powerful assumptions that mainstream scientists find it necessary to make, and the enormous frustration they feel when they are asked to take seriously persons who refuse to accept those assumptions.

What Darwinists like Dawkins despise as "creationism" is something much broader than biblical fundamentalism or even Christianity and what they proclaim as "evolution" is something much narrower than what the word means in common usage. All persons who affirm that "God creates" are in an important sense creationists, even if they believe that the Genesis story is a myth and that God created gradually through evolution over billions of years. This follows from the fact that the theory of evolution in question is naturalistic evolution, meaning evolution that involves no intervention or guidance by a creator outside the world of nature.

Naturalistic evolution is consistent with the existence of "God" only if by that term we mean no more than a first cause which retires from further activity after establishing the laws of nature and setting the natural mechanism in motion. Persons who say they believe in evolution, but who have in mind a process guided by an *active* God who purposely intervenes or controls the process to accomplish some end, are using the same term that the Darwinists use, but they mean something very different by it. For example, here is what Douglas Futuyma, the author of a leading college evolutionary biology textbook, finds to be the most important conflict between the theory of evolution and what he thinks of as the "fundamentalist" perspective:

Perhaps most importantly, if the world and its creatures developed purely by material, physical forces, it could not have been designed and has no purpose or goal. The fundamentalist, in contrast, believes that everything in the world, every species and every characteristic of every species, was designed by an intelligent, purposeful artificer, and that it was made for a purpose. Nowhere does this contrast apply with more force than to the human species. Some shrink from the conclusion that the human species was not designed, has no purpose, and is the product of mere material mechanisms-but this seems to be the message of evolution. (*Science on Trial: The Case for Evolution*)

It is not only "fundamentalism," of course, but theists of any description who believe that an intelligent artificer made humanity for a purpose, whether through evolution or otherwise. Futuyma's doctrinaire naturalism is not just some superfluous philosophical addition to Darwinism that can be discarded without affecting the real "science" of the matter. If some powerful conscious being exists outside the natural order, it might use its power to intervene in nature to accomplish some purpose, such as the production of beings having consciousness and free will. If the possibility of an "outside" intervention is allowed in nature at any point, however, the whole naturalistic worldview quickly unravels.

Occasionally, a scientist discouraged by the consistent failure of theories purporting to explain some problem like the first appearance of life will suggest that perhaps supernatural creation is a tenable hypothesis in this one instance. Sophisticated naturalists instantly recoil with horror, because they know that there is no way to tell God when he has to stop. If God created the first organism, then how do we know he didn't do the same thing to produce all those animal groups that appear so suddenly in the Cambrian rocks? Given the existence of a designer ready and willing to do the work, why should we suppose that random mutations and natural selection are responsible for such marvels of engineering as the eye and the wing?

Because the claims of Darwinism are presented to the public as "science" most people are under the impression that they are supported by direct evidence such as experiments and fossil record studies. This impression is seriously misleading. Scientists cannot observe complex biological structures being created by random mutations and selection in a laboratory or elsewhere. The fossil record, as we have seen, is so unhelpful that the important steps in evolution must be assumed to have occurred within its "gaps." Darwinists believe that the mutation-selection mechanism accomplishes wonders of creativity not because the wonders can be demonstrated, but because they cannot think of a more plausible explanation for the existence of wonders that does not involve an unacceptable *creator*, i.e., a being or force outside the world of nature. According to Gareth Nelson, "evidence, or proof, of origins of the universe, of life, of all the major groups of life, of all the minor groups of life, indeed of all the species-is weak or nonexistent when measured on an absolute scale." Nelson, a senior zoologist at the American Museum of Natural History, wrote that statement in the preface to a recent book by Wendell Bird, the leading attorney for the creationist organizations. Nelson himself is no creationist, but he is sufficiently disgusted with Darwinist dogmatism that he looks benignly upon unorthodox challengers.

Philosophical naturalism is so deeply ingrained in the thinking of many educated people today, including theologians, that they find it difficult even to imagine any other way of looking at things. To such people, Darwinism seems so logically appealing that only a modest amount of confirming evidence is needed to prove the whole system, and so they point to the peppered-moth example as virtually conclusive. Even if they do develop doubts whether such



modest forces can account for large-scale change, their naturalism is undisturbed. Since there is nothing outside of nature, and since *something* must have produced all the kinds of organisms that exist, a satisfactory naturalistic mechanism must be waiting to be discovered.

The same situation looks quite different to people who accept the possibility of a creator outside the natural order. To such people, the peppered-moth observations and similar evidence seem absurdly inadequate to prove that natural selection can make a wing, an eye, or a brain. From their more skeptical perspective, the consistent pattern in the fossil record of sudden appearance followed by stasis tends to prove that there is something wrong with Darwinism, not that there is something wrong with the fossil record. The absence of proof "when measured on an absolute scale" is unimportant to a thoroughgoing naturalist, who feels that science is doing well enough if it has a plausible explanation that maintains the naturalistic worldview. The same absence of proof is highly significant to any person who thinks it possible that there are more things in heaven and earth than are dreamt of in naturalistic philosophy.

Victory in the creation-evolution dispute therefore belongs to the party with the cultural authority to establish the ground rules that govern the discourse. If creation is admitted as a serious possibility, Darwinism cannot win, and if it is excluded *a priori* Darwinism cannot lose. The point is illustrated by the logic which the Natural Academy of Sciences employed to persuade the Supreme Court that "creation-scientists" should not be given an opportunity to present their case against the theory of evolution in science classes. Creation-Science is not science, said the Academy, because

it fails to display the most basic characteristic of science: reliance upon naturalistic explanations. Instead, proponents of "creation- science" hold that the creation of the universe, the earth, living things, and man was accomplished through supernatural means inaccessible to human understanding.

Besides, the Academy's brief continued, creationists do not perform scientific research to establish the mechanism of supernatural creation, that being by definition impossible. Instead, they seek to discredit the scientific theory of evolution by amassing evidence that is allegedly consistent with the relatively recent, abrupt appearance of the universe, the earth, living things, and man in substantially the same form as they now have.

"Creation-science" is thus manifestly a device designed to dilute the persuasiveness of the theory of evolution. The dualistic mode of analysis and the negative argumentation employed to accomplish this dilution is, moreover, antithetical to the scientific method.

The Academy's brief went on to cite evidence for evolution, but evidence was unnecessary. Creationists are disqualified from making a positive case, because science by definition is based upon naturalism. The rules of science also disqualify any purely negative argumentation designed to dilute the persuasiveness of the theory of evolution. Creationism is thus out of court and out of the classroom-before any consideration of evidence. Put yourself in the place of a creationist who has been silenced by that logic, and you may feel like a criminal defendant who has just been told that the law does not recognize so absurd a concept as "innocence."

With creationist explanations disqualified at the outset, it follows that the evidence will always support the naturalistic alternative. We can be absolutely certain that the Academy will not say, "The evidence on the whole supports the theory of evolution, although we concede that the apparent abrupt appearance of many fully formed animal groups in the Cambrian rocks is in itself a point in favor of the creationists." There are no scientific points in favor of creation and there never will be any as long as naturalists control the definition of science, because creationist explanations by definition violate the fundamental commitment of science to naturalism. When the fossil record does not provide the evidence that naturalism would like to see, it is the fossil record, and not the naturalistic explanation, that is judged to be inadequate.

When pressed about the unfairness of disqualifying their opponents *a priori*, naturalists sometimes portray themselves as merely insisting upon a proper definition of "science," and not as making any absolute claims about "truth." By this interpretation, the National Academy of Sciences did not say that it is *untrue* that "the creation of the universe, the earth, living things and man was accomplished through supernatural means inaccessible to human understanding," but only that this statement is *unscientific*. Scientific naturalists who take this line sometimes add that they do not necessarily object to the study of creationism in the public schools, provided it occurs in literature and social science classes rather than in science class.

This naturalist version of balanced treatment is not a genuine attempt at a fair accommodation of competing worldviews, but a rhetorical maneuver. It enables naturalists effectively to label their own product as fact and its rival as fantasy, without having to back up the decision with evidence. The dominant culture assumes that science provides *knowledge*, and so in natural science classes fundamental propositions can be proclaimed as objectively true, regardless of how many dissenters believe them to be false. That is the powerful philosophical meaning of the claim that "evolution is a fact." By contrast, in literature class we read poetry and fiction, and in social science we study the subjective *beliefs* of various cultures from a naturalistic perspective. If you have difficulty seeing just how loaded this knowledge-belief distinction is, try to imagine the reaction of Darwinists to the suggestion that their theory should be removed from the college biology curriculum and studied instead in a course devoted to nineteenth-century intellectual history.

By skilful manipulation of categories and definitions, the Darwinists have established philosophical naturalism as educational orthodoxy in a nation in which the overwhelming majority of people express some form of theistic belief inconsistent with naturalism. According to a 1982 Gallup poll aimed at measuring nationwide opinion, 44 percent of respondents agreed with the statement that "God created man pretty much in his present form at one time within the last 10,000 years." That would seem to mark those respondents as creationists in a relatively narrow sense. Another 38 percent accepted evolution as a process guided by God. Only 9 percent identified themselves as believers in a naturalistic evolutionary process not guided by God. The philosophy of the 9 percent is now to be taught in the schools as unchallengeable truth.

Cornell University Professor William Provine, a leading historian of Darwinism, concluded from Gallup's figures that the American public simply does not understand what the scientists means by evolution. As Provine summarized the matter, "The destructive implications of evolutionary biology extend far beyond the assumptions of organized religion to a much deeper and more pervasive belief, held by the vast majority of people, that non-mechanistic organizing designs or forces are somehow responsible for the visible order of the physical

universe, biological organisms, and human moral order." Provine blamed the scientific establishment itself for misleading the public about the absolute incompatibility of contemporary Darwinism with any belief in God, designing forces, or absolute standards of good and evil. Scientific leaders have obscured the conflict for fear of jeopardizing public support for their funding, and also because some of them believe that religion may still play a useful role in maintaining public morality. According to Provine, "These rationalizations are politic but intellectually dishonest."

The organizations that speak officially for science continue to deny that there is a conflict between Darwinism and "religion." This denial is another example of the skilful manipulation of definitions, because there are evolution-based religions that embrace naturalism with enthusiasm. Stephen Jay Gould holds up the geneticist Theodosius Dobzhansky, "the greatest evolutionist of our century and a lifelong Russian Orthodox," as proof that evolution and religion are compatible. The example is instructive, because Dobzhansky made a religion out of evolution. According to a eulogy by Francisco Ayala, "Dobzhansky was a religious man, although he apparently rejected fundamental beliefs of traditional religion, such as the existence of God and of life beyond physical death. His religiosity was grounded on the conviction that there is meaning in the universe. He saw that meaning in the fact that evolution has produced the stupendous diversity of the living world and has progressed from primitive forms of life to mankind...He believed that somehow mankind would eventually evolve into higher levels of harmony and creativity." In short, Dobzhansky was what we would today call a New Age pantheist. Of course evolution is not incompatible with religion when the religion is evolution.

Dobzhansky was one of the principal founders of the neo-Darwinian synthesis. Another was Julian Huxley, who promoted a religion of "evolutionary humanism." A third was the paleontologist George Gaylord Simpson. Simpson explained in his book *The Meaning of Evolution* that "there are some beliefs still current, labeled as religious and involved with religious emotions, that conflict with evolution and are therefore intellectually untenable in spite of their emotional appeal." Simpson added that it is nonetheless "self-evident ...that evolution and true religion are compatible." By true religion he meant naturalistic religion, which accepts that "man is the result of a purposeless and natural process that did not have him in mind." Because efforts have been made to obscure the point, it should be emphasized that Simpson's view is not some personal opinion extraneous to the real "science" of Darwinism. It is an expression of the same naturalism that gives Darwinists confidence that mutation and natural selection, Darwinism's "blind watchmaker," can do all the work of a creator.

Against this background readers may perceive the cruel irony in Justice Brennan's opinion for the Supreme Court majority, holding the Louisiana "balanced treatment" statute unconstitutional because the creationists who promoted it had a "religious purpose." Of course they had a religious purpose, if by that we mean a purpose to try to do something to counter the highly successful efforts of proponents of naturalism to) have their philosophy established in the public schools as "fact." If creationists object to naturalistic evolution on religious grounds, they are admonished that it is inappropriate for religion to meddle with science. If they try to state scientific objections, they are disqualified instantly by definitions devised for that purpose by their adversaries. Sisyphus himself, eternally rolling his stone up that hill in Hades, must pity their frustration.

The Darwinists are also frustrated, however, because they find the resurgence of creationism baffling. Why can't these people learn that the evidence for evolution is overwhelming? Why do they persist in denying the obvious? Above all, how can they be so dishonest as to claim that scientific evidence supports their absurd position? Writing the introduction to a collection of polemics titled *Scientists Confront Creationism*, Richard Lewontin attempted to explain why creationism is doomed by its very nature. Because he is a dedicated Marxist as well as a famous geneticist, Lewontin saw the conflict between creation and evolution as a class struggle, with history inevitably awarding the victory to the naturalistic class. The triumph of evolution in the schools in the post-Sputnik era signaled that "the culture of the dominant class had triumphed, and traditional religious values, the only vestige of control that rural people had over their own lives and the lives of their families, had been taken away from them." In fact, many creationists are urban professionals who make their living from technology, but Lewontin's basic point is valid. The "fact of evolution" is an instrument of cultural domination and it is only to be expected that people who are being consigned to the dustbin of history should make some protest.

Lewontin was satisfied that creationism cannot survive because its acceptance of miracles puts it at odds with the more rational perception of the world as a place where all events have natural causes. Even a creationist "crosses seas not on foot but in machines, finds the pitcher empty when he has poured out its contents, and the cupboard bare when he has eaten the last of the loaf" Lewontin thus saw creationism as falsified not so much by any discoveries of modern science as by universal human experience, a thesis that does little to explain either why so absurd a notion has attracted so many adherents or why we should expect it to lose ground in the near future.

Once again we see how the power to define can be used to distort, especially when the critical definition is implicit rather than exposed to view. (I remind the reader that to Lewontin and myself, a "creationist" is not necessarily a biblical literalist, but rather any person who believes that God creates.) If creationists really were people who live in an imaginary world of continual miracles, there would be very few of them. On the contrary, from a creationist point of view, the very fact that the universe is on the whole orderly, in a manner comprehensible to our intellect, is evidence that we and it were fashioned by a common intelligence. What is truly a miracle, in the pejorative sense of an event having no rational connection with what has gone before, is the emergence of a being with consciousness, free will, and a capacity to understand the laws of nature in a universe which in the beginning contained only matter in mindless motion.

Once we understand that biologists like Lewontin are employing their scientific prestige in support of a philosophical platform, there is no longer any reason to be intimidated by their claims to scientific expertise. On the contrary, the inability of most biologist to make any sense out of creationist criticisms of their presuppositions is evidence of their own philosophical naivete'. The "overwhelming evidence for naturalistic evolution" no longer overwhelms when the naturalistic worldview is itself called into question, and that worldview is as problematical as any other set of metaphysical assumptions when it is placed on the table for examination rather than being taken for granted as "the way we think today."

The problem with scientific naturalism as a worldview is that it takes a sound methodological premise of natural science and transforms it into a dogmatic statement about the nature of the universe. Science is committed by definition to empiricism, by which I mean that scientists seek to find truth by observation, experiment, and calculation rather than by studying sacred

books or achieving mystical states of mind. It may well be, however, that there are certain questions-important questions, ones to which we desperately want to know the answers-that cannot be answered by the methods available to our science. These may include not only broad philosophical issues such as whether the universe has a purpose, but also questions we have become accustomed to think of as empirical, such as how life first began or how complex biological systems were put together.

Suppose, however, that some people find it intolerable either to be without answers to these questions or to allow the answers to come from anyone but scientists. In that case science must provide answers, but to do this, it must invoke *scientism*, a philosophical doctrine which asserts arbitrarily that knowledge comes only through the methods of investigation available to the natural sciences. The Soviet Cosmonaut who announced upon landing that he had been to the heavens and had not seen God was expressing crudely the basic philosophical premise that underlies Darwinism. Because we cannot examine God in our telescopes or under our microscopes, God is unreal. It is meaningless to say that some entity exists if in principle we can never have knowledge of that entity.

With the methodology of scientism in mind, we can understand what it means to contrast scientific "knowledge" with religious "belief," and what follows from the premise that natural science is not suitable for investigating whether the universe has a purpose. Belief is inherently subjective, and includes elements such as fantasy and preference. Knowledge is in principle objective, and includes elements such as facts and laws. If science does not investigate the purpose of the universe, then the universe effectively has no purpose, because a purpose of which we can have no knowledge is meaningless to us. On the other hand, the universe does exist, and all its features must be explicable in terms of forces and causes accessible to scientific investigation. It follows that the best naturalistic explanation available is effectively true, with the proviso that it may eventually be supplanted by a better or more inclusive theory. Thus naturalistic evolution is a fact, and the fact implies a critical guiding role for natural selection.

Scientism itself is not a fact, however, nor is it attractive as a philosophy once its elements and consequences are made explicit. Persons who want naturalistic evolution to be accepted as unquestioned fact must therefore use their cultural authority to enact rules of discourse that protect the purported fact from the attacks of unbelievers. First, they can identify science with naturalism, which means that they insist as a matter of first principle that no consideration whatever be given to the possibility that mind or spirit preceded matter. Second, they can impose a rule of procedure that disqualifies purely negative argument, so that a theory which obtains some very modest degree of empirical support can become immune to disproof until and unless it is supplanted by a better naturalistic theory. With these rules in place, Darwinists can claim to have proved that natural selection crafted moths, trees, and people, and point to the peppered-moth observation as proof.

The assumption of naturalism is in the realm of speculative philosophy, and the rule against negative argument is arbitrary. It is as if a judge were to tell a defendant that he may not establish his innocence unless he can produce a suitable substitute to be charged with the crime. Such vulnerable rules of discourse need protection from criticism, and two distinct rhetorical strategies have been pursued to provide it. First, we have already seen that the direct conflict between Darwinism and theism has been blurred, so that theists who are not committed to biblical inerrancy are led to believe that they have no reason to be suspicious of Darwinism. The remaining objectors can be marginalized as fundamentalists, whose

purportedly scientific objections need not be taken seriously because "everybody knows" that people like that will believe, and say, anything.

The second strategy is to take advantage of the prestige that science enjoys in an age of technology, by asserting that anyone who disputes Darwinism must be an enemy of science, and hence of rationality itself. This argument gains a certain plausibility from the fact that Darwinism is not the only area within the vast realm of science where such practices as extravagant extrapolation, arbitrary assumptions, and metaphysical speculation have been tolerated. The history of scientific efforts to explain human behavior provides many examples, and some aspects of cosmology, such as its Anthropic Principle, invite the label "cosmo-theology." What makes the strategy effective, however, is not the association of Darwinism with the more speculative aspects of cosmology, but its purported link with technology. Donald Johanson put the point effectively, if crudely: "You can't accept one part of science because it brings you good things like electricity and penicillin and throw away another part because it brings you some things you don't like about the origin of life."

But why can't you do exactly that? That scientists can learn a good deal about the behavior of electrons and bacteria does not prove that they know how electrons or bacteria came into existence in the first place. It is also possible that contemporary scientists are insightful upon some matters and, like their predecessors, thoroughly confused about others. Twentieth-century experience demonstrates that scientific technology can work wonders, of course. It also demonstrates that dubious doctrines based upon philosophy can achieve an undeserved respectability by cloaking themselves in the mystique of science. Whether Darwinism is another example of pseudoscience is the question, and this question cannot be answered by a vague appeal to the authority of science.

For now, things are going well for Darwinism in America. The Supreme Court has dealt the creationists a crushing blow, and state boards of education are beginning to adopt "science frameworks." These policy statements are designed to encourage textbook publishers to proclaim boldly the fact of evolution-and therefore the naturalistic philosophy that underlies the fact-instead of minimizing the subject to avoid controversy. Efforts are also under way to bring under control any individual teachers who express creationist sentiments in the classroom, especially if they make use of unapproved materials. As ideological authority collapses in other parts of the world, the Darwinists are successfully swimming against the current.

There will be harder times ahead, however. The Darwinist strategy depends upon a certain blurring of the issues, and in particular upon maintaining the fiction that what is being promoted is an inoffensive "fact of evolution," which is opposed only by a discredited minority of religious fanatics. As the Darwinists move out to convert the nation's school children to a naturalistic outlook, it may become more and more difficult to conceal the religious implications of their system. Plenty of people within the Darwinist camp know what is being concealed, and cannot be relied upon to maintain a discreet silence. William Provine, for example, has been on a crusade to persuade the public that it has to discard either Darwinism or God, and not only God but also such non-materialistic concepts as free will and objective standards of morality. Provine offers this choice in the serene confidence that the biologists have enough evidence to persuade the public to choose Darwinism, and to accept its philosophical consequences.

The establishment of naturalism in the schools is supposedly essential to the improvement of science education, which is in such a dismal state in America that national leaders are truly worried. It is not likely, however, that science education can be improved in the long run by identifying science with a worldview abhorred by a large section of the population, and then hoping that the public never finds out what is being implied. The project requires that the scientific establishment commit itself to a strategy of indoctrination, in which the teachers first tell students what they are supposed to believe and then inform them about any difficulties only later, when it is deemed safe to do so. The weakness that requires such dogmatism is evident in Philip Kitcher's explanation of why it is "insidious" to propose that the creationists be allowed to present their negative case in the classroom:

There will be ...much dredging up of misguided objections to evolutionary theory. The objections are spurious-but how is the teacher to reveal their errors to students who are at the beginning of their science studies? ...What Creationists really propose is a situation in which people without scientific training-fourteen-year-old students, for example-are asked to decide a complex issue on partial evidence.

A few centuries ago, the defenders of orthodoxy used the same logic to explain why the common people needed to be protected from exposure to the spurious heresies of Galileo. In fairness, the creationists Kitcher had in mind are biblical fundamentalists who want to attack orthodox scientific doctrine on a broad front I do not myself think that such advocacy groups should be given a platform in the classroom. In my experience, however, Darwinists apply the same contemptuous dismissal to any suggestion, however well-informed and modestly stated, that in constructing their huge theoretical edifice upon a blind commitment to naturalism, they may have been building upon the sand. As long as the media and the courts are quiescent, they may retain the power to marginalize dissent and establish their philosophy as orthodoxy. What they do not have the power to do is to make it true.

(Johnson P.E. "Evolution as Dogma: The Establishment of Naturalism," *Foundation for Thought and Ethics*: Richardson, Texas, 1990, pp1-17)

[return to top of page](#)

This article was originally published in *First Things*, October 1990, and was reprinted by the *Foundation for Thought and Ethics*. Republished here by permission.

Copyright ©1990 First Things. All rights reserved. International copyright secured.  
File Date:2.01.00

[replica breitling breitling replica watches](#)

## **Darwinists Squirm Under Spotlight**

### **Interview with Phillip E. Johnson**

This article is reprinted from an interview with *Citizen Magazine*, January 1992.

*Phillip Johnson has been a law professor at the University of California at Berkeley for more than 20 years. As an academic lawyer, one of Johnson's specialties is "analyzing the logic of arguments and identifying the assumptions that lie behind those arguments." A few years ago he began to suspect that Darwinism, far from being an objective fact, was little more than a philosophical position dressed up as science--and poor science at that. Wanting to see whether his initial impression was correct, Johnson decided to take a closer look at the arguments, evidence and assumptions underlying contemporary Darwinism. The result of his investigation is Darwin on Trial, a controversial new book that challenges not only Darwinism but the philosophical mindset that sustains it.*

**When did you first become aware that Darwinism was in trouble as a scientific theory?**

I had been vaguely aware that there were problems, but I'd never had any intention of taking up the subject seriously or in detail until the 1987-88 academic year, when I was a visiting professor in London. Every day on the way to my office I happened to go by a large bookstore devoted to science. I picked up one book after another and became increasingly fascinated with the obvious difficulties in the Darwinist case--difficulties that were being evaded by tricky rhetoric and emphatic repetition. I then began delving into the professional literature, especially in scientific journals such as Nature and Science. At every step, what I found was a failure of the evidence to be in accord with the theory.

**What was it that initially made you suspect that Darwinism was more philosophy than hard science?**

It was the way my scientific colleagues responded when I asked the hard questions. Instead of taking the intellectual questions seriously and responding to them, they would answer with all sorts of evasions and vague language, making it impossible to discuss the real objections to Darwinism. This is the way people talk when they're trying very hard not to understand something.

Another tip-off was the sharp contrast I noticed between the extremely dogmatic tone that Darwinists use when addressing the general public and the occasional frank acknowledgments, in scientific circles, of serious problems with the theory. For example, I would read Stephen Jay Gould telling the scientific world that Darwinism was effectively dead as a theory. And then in the popular literature, I would read Gould and other scientific writers saying that Darwinism was fundamentally healthy, and that scientists had the remaining problems well under control. There was a contradiction here, and it looked as though there was an effort to keep the outside world from becoming aware of the serious intellectual difficulties.

**What are some of the intellectual difficulties? Can you give an example?**

The most important is the fossil problem, because this is a direct record of the history of life on earth. If Darwinism were true, you would expect the fossil evidence to contain many examples of Darwinian evolution. You would expect to see fossils that really couldn't be understood except as transitions between one kind of organism and another. You would also expect to see some of the common ancestors that gave birth to different groups like fish and reptiles. You wouldn't expect to find them in every case, of course. It's perfectly reasonable to say that a great deal of the fossil evidence has been lost. But you would continually be finding examples of things that fit well with the theory.

In reality, the fossil record is something that Darwinists have had to explain away, because what it shows is the sudden appearance of organisms that exhibit no trace of step-by-step



development from earlier forms. And it shows that once these organisms exist, they remain fundamentally unchanged, despite the passage of millions of years-and despite climatic and environmental changes that should have produced enormous Darwinian evolution if the theory were true. In short, if evolution is the gradual, step-by-step transformation of one kind of thing into another, the outstanding feature of the fossil record is the absence of evidence for evolution.

**But isn't it possible, as many Darwinists say, that the fossil evidence is just too scanty to show evidence of Darwinian evolution?**

The question is whether or not Darwinism is a scientific theory that can be tested with scientific evidence. If you assume that the theory is true, you can deal with conflicting evidence by saying that the evidence has disappeared. But then the question arises, how do you know it's true if it isn't recorded in the fossils? Where is the proof? It's not in genetics. And it's not in the molecular evidence, which shows similarities between organisms but doesn't tell you how those similarities came about. So the proof isn't anywhere, and it's illegitimate to approach the fossil record with the conclusive assumption that the theory is true so that you can read into the fossil record whatever you need to support the theory.

**If Darwinism has been so thoroughly disconfirmed, why do so many scientists say it's a fact?**

There are several factors that explain this. One is that Darwinism is fundamentally a religious position, not a scientific position. The project of Darwinism is to explain the world and all its life forms in a way that excludes any role for a creator. And that project is sacred to the scientific naturalist-to the person who denies that God can in any way influence natural events.

It's also an unfortunate fact in the history of science that scientists will stick to a theory which is untrue until they get an acceptable alternative theory-which to a Darwinist means a strictly naturalistic theory. So for them, the question is not whether Darwinism is true. The question is whether there is a better theory that's philosophically acceptable. Any suggestion that Darwinism is false, and that we should admit our ignorance about the origin of complex life-forms, is simply unacceptable. In their eyes, Darwinism is the best naturalistic theory, and therefore effectively true. The argument that it's false can't even be heard.

**Surely there are some skeptics in the scientific world. What of them?**

Well, there are several, and we can see what happened to them. You have paleontologist Colin Patterson, who's quoted in my first chapter. He made a very bold statement, received a lot of vicious criticism, and then pulled back. This is a typical pattern.

Another pattern is that of Stephen Jay Gould, who said that Darwinism is effectively dead as a general theory-and then realized that he had given a powerful weapon to the creationists, whose existence cannot be tolerated. So now Gould says that he's really a good Darwinist, and that all he really meant was that Darwinism could be improved by developing a larger theory that included Darwinism. What we have here is politics, not science. Darwinism is politically correct for the scientific community, because it enables them to fight off any rivals for cultural authority.

**Darwinists often accuse creationists of intolerance. But you're suggesting that the Darwinists are intolerant?**

If you want to know what Darwinist science is really like, read what the Darwinists say about

the creationists, because those things--regardless of whether they're true about the creationists--are true about the Darwinists. I've found that people often say things about their enemies that are true of themselves. And I think Darwinist science has many of the defects that the Darwinists are so indignant about when they describe the creationists.

**Across the country, there has been a growing trend toward teaching evolution as a fact--especially in California, your own state. What does this say about science education in America?**

This is an attempt to establish a religious position as orthodox throughout the educational establishment, and thus throughout the society. It's gone very far. The position is what I call "scientific naturalism." The scientific organizations, for example, tell us that if we wish to maintain our country's economic status and cope with environmental problems, we must give everyone a scientific outlook. But the "scientific outlook" they have in mind is one which, by definition, excludes God from any role in the world, from the Big Bang to the present. So this is fundamentally a religious position--a fundamentalist position, if you like--and it's being taught in the schools as a fact when it isn't even a good theory.

**Why should Christians be concerned about a scientific theory? Why does it matter?**

Well, not only Christians should care about it. Everyone should. It is religion in the name of science, and that means that it is misleading people about both religion and science.

Copyright 1997 Phillip E. Johnson. All rights reserved. International copyright secured.  
File Date:2.22.97

[replica breitling breitling replica watches](#)

**Starting a Conversation about Evolution**

***A review of *The Battle of the Beginnings: Why Neither Side is Winning the Creation-Evolution Debate* by Del Ratzsch***

**Phillip E. Johnson**

Del Ratzsch, professor of philosophy of science at Calvin College, has written a flawed but thoughtful book that encourages me to hope that, despite some unfortunate resentments and misunderstandings, the Christian intellectual response to evolutionary naturalism may be converging on a common set of principles. I am afraid that many readers may miss Ratzsch's most significant points, however, because they are presented in a context that tends to conceal their importance.

It appears that Ratzsch started out to write a critical analysis of the conflict between neo-Darwinism and creation- science -- as exemplified on the one hand by the British zoologist and fervent atheist Richard Dawkins, and on the other hand by the young-earth fundamentalist Henry Morris and his creation-science movement. Ratzsch's original aim seems to have been to show that some bad arguments have been made by both sides in this polarized conflict, and then to defend the compromise position called "theistic evolution" from the charge that it is no more than a vacuous attempt to split the difference between theism and naturalism. That doesn't sound very new or exciting, but somewhere along the way Ratzsch seems to have

recognized that the old creation/evolution debate is getting redefined, and he makes some constructive points to help that process along.

Ratzsch's subtitle says that "neither side is winning" the battle between the neo-Darwinists and the Biblical creationists. I cannot imagine what gives him that impression, since the Darwinian position dominates not only science, but government, the universities, the public schools, and the media. Most people I meet in the secular university world have gained what little information they have about creationism from the writings of its principal enemies, such as Carl Sagan, Stephen Jay Gould, and Isaac Asimov. They take for granted that evolutionary science has explained or soon will have explained the entire history of life on naturalistic principles. To the extent that they take any notice of either creation-science or theistic evolution, they consign both to the subjective realm of "religion," which has nothing to do with an objective science like biology.

Given this state of affairs, it is difficult to see what Ratzsch could expect to accomplish by his concluding recommendation that "maybe the various sides [to the creation/evolution debate] should talk. Not debate--talk. It is just possible, neither side being omniscient, that both sides could gain something from serious contact with competent practitioners on the other."

If Ratzsch is proposing a serious, mutually respectful conversation between the neo-Darwinists and the Biblical creationists, he is in need of a reality check. The position of just about everyone with any influence in evolutionary science is that creationism is not science, and its practitioners by definition cannot be competent. This is the case not only because creationists are deemed to be prejudiced by their belief that the Bible has authority over scientific questions, but even more fundamentally because they reject naturalism, which is the philosophical basis of contemporary science.

Theistic evolutionists fare little better. Most theistic evolutionists do not challenge either the conclusions of evolutionary biology or its naturalistic methodology, but argue merely that evolution by natural processes is compatible with theistic religion. To the extent that they go farther, and postulate a supernatural directing force in evolution, they violate the rules of methodological naturalism and are no more welcome in scientific discussions than outright creationists. In either case, what scientific topic is there to talk about?

For a productive scientific conversation to be even conceivable there would have to be a new force in the picture, one which is capable of entering the debate with arguments which the naturalists cannot easily refuse to take seriously. Almost halfway through his book Ratzsch discloses that a potential force of that kind has in fact emerged, a new phenomenon which he mysteriously refers to as an "upper tier" of creationists. He explains that this group consists of persons with doctorates from first-class universities, who are performing serious scientific and philosophical work to advance concepts like "intelligent design" and "irreducible complexity" as legitimate descriptions of biological reality. Although Ratzsch does not name any of the members of this "upper tier" in his text (a few references are provided in the Notes), or discuss their work in any detail, he apparently sympathizes with their objectives and endorses some important principles that are essential to gain them a fair hearing.

In particular, Ratzsch rejects the argument that science is defined by its adherence to naturalism, pointing out that such a dogmatic standard potentially conflicts with the principle that science should be a "no holds barred" search for truth. Unless we have *a priori* knowledge that naturalism is true, then we cannot rule out the possibility that

supernatural action may have affected the history of life, and that evidence of that action may exist. Ratzsch similarly rejects Richard Dawkins' argument that reference to a creator in science as the source of biological complexity is logically pernicious because it leaves the creator unexplained. *Every* explanation has an unexplained starting point. A theistic science starts with an uncreated creator; a naturalistic science starts with something like particles and natural laws, and goes on from there. *If* living organisms -- up to and including human minds -- can be created by unintelligent material processes, then the need for a creator (at least after the ultimate beginning) is greatly lessened if not eliminated. But the "if" that begins that sentence can be satisfied only by evidence, not by defining "science" to exclude any other possibility.

On similar grounds Ratzsch rejects the argument, frequently made by theistic evolutionists, that to posit action by a creator anywhere in the history of life is to invoke a futile "god of the gaps," who will inevitably be expelled from reality as science advances to fill the gaps with naturalistic explanations. Ratzsch sensibly retorts that "If there are no gaps in the fabric of natural explanation, then obviously appeal to divine activity will get us off track. On the other hand, if there are such gaps, refusing in principle to recognize them will equally get us off the track." That is particularly cogent reasoning if the so-called "gaps" involve not minor details but such fundamental problems as accounting for the existence of irreducibly complex genetic information.

In all these instances Ratzsch insists upon a principle I heartily endorse; he will not permit either side to win its case by controlling the definition of terms. Either organisms show evidence of design or they do not; either mindless processes like mutation and selection can make complex biological organisms or they can not. The determination should be made by a fair assessment of the evidence and not by defining "science" as an enterprise that inherently assumes the one possibility and excludes the other.

This endorsement of a level playing field is more radical than readers may suppose. The view that science and methodological naturalism are inseparable is widespread among many scientists and philosophers, including theistic evolutionists, and makes it impossible for them to take seriously the possibility that the creation of genetic information might require intelligence. Show them a computer program and they will never question the need for a programmer. Show them a much more impressive example of design in nature, and they will never doubt that unintelligent material processes must have been responsible for the appearance of design. Even if they give lip service to the possibility that a designer might exist, they will insist on standards of evaluation that ensure that a putative example of design can never be more than a problem that naturalistic science has not yet solved.

Ratzsch is aware that the appeal of evolutionary naturalism owes as much to moral and spiritual factors as to scientific evidence. He says in his preface that he was raised a Christian fundamentalist, and taught to respect science but to distrust Darwinism. At first he wanted to reconcile Genesis, religion, and evolution, but at some point along the way I think I ceased to want them to be reconcilable. Evolution, along with the new cosmologies and backed by the undentable prestige of science, became part of a gratifyingly sophisticated excuse for unbelief -- a ticket out of an oppressive universe with a God who set boundaries and made demands, into one where we set the rules and the cosmos itself was the only limit. (It was this personal experience as much as anything that has convinced me that creation-evolution issues frequently run much deeper than mere scientific theory.)

I was raised as a nominal Christian, not a fundamentalist, but otherwise my story would be similar. My own realization that there is a profound relationship between naturalistic philosophy and Darwinian science led to my writing two books and many articles on this subject. It also led to my forming a rewarding colleagueship with a group of scholars and scientists whom I judge capable of holding their own in a serious conversation with the scientific naturalists. This group is the "upper tier" of professors and researchers whose existence Ratzsch so tentatively acknowledges as the new factor in the debate.

My colleagues and I speak of "theistic realism" -- or sometimes, "mere creation" --as the defining concept of our movement. This means that we affirm that God is objectively real as Creator, and that the reality of God is tangibly recorded in evidence accessible to science, particularly in biology. We avoid the tangled arguments about how or whether to reconcile the Biblical account with the present state of scientific knowledge, because we think these issues can be much more constructively engaged when we have a scientific picture that is not distorted by naturalistic prejudice. If life is not simply matter evolving by natural selection, but is something that had to be designed by a creator who is *real*, then the nature of that creator, and the possibility of revelation, will become a matter of widespread interest among thoughtful people who are currently being taught that evolutionary science has shown God to be a product of the human imagination.

Our movement is something of a scandal in some sections of the Christian academic world for the same reason that it is exciting: we propose actually to engage in a serious conversation with the mainstream scientific culture on fundamental principles, rather than to submit to its demand that naturalism be conceded as the basis for all scientific discussion. That raises the alarming possibility, as one of Ratzsch's colleagues put it in criticizing me, that "the gulf between the academy and the sanctuary will only grow wider." The bitter feeling that has been spawned in some quarters by that possibility may explain why Ratzsch discusses our group so tentatively, but no matter. What matters for the present is to open up the discussion, and to that end Del Ratzsch has made a positive contribution.

Copyright © 1996 Phillip E. Johnson. All rights reserved. International copyright secured.  
File Date: 8.31.96

[replica breitling breitling replica watches](#)

## **Starting a Conversation about Evolution**

### ***A review of *The Battle of the Beginnings: Why Neither Side is Winning the Creation-Evolution Debate* by Del Ratzsch***

#### **Phillip E. Johnson**

Del Ratzsch, professor of philosophy of science at Calvin College, has written a flawed but thoughtful book that encourages me to hope that, despite some unfortunate resentments and misunderstandings, the Christian intellectual response to evolutionary naturalism may be converging on a common set of principles. I am afraid that many readers may miss Ratzsch's most significant points, however, because they are presented in a context that tends to conceal their importance.

It appears that Ratzsch started out to write a critical analysis of the conflict between neo-Darwinism and creation-science -- as exemplified on the one hand by the British zoologist and fervent atheist Richard Dawkins, and on the other hand by the young-earth fundamentalist Henry Morris and his creation-science movement. Ratzsch's original aim seems to have been to show that some bad arguments have been made by both sides in this polarized conflict, and then to defend the compromise position called "theistic evolution" from the charge that it is no more than a vacuous attempt to split the difference between theism and naturalism. That doesn't sound very new or exciting, but somewhere along the way Ratzsch seems to have recognized that the old creation/evolution debate is getting redefined, and he makes some constructive points to help that process along.

Ratzsch's subtitle says that "neither side is winning" the battle between the neo-Darwinists and the Biblical creationists. I cannot imagine what gives him that impression, since the Darwinian position dominates not only science, but government, the universities, the public schools, and the media. Most people I meet in the secular university world have gained what little information they have about creationism from the writings of its principal enemies, such as Carl Sagan, Stephen Jay Gould, and Isaac Asimov. They take for granted that evolutionary science has explained or soon will have explained the entire history of life on naturalistic principles. To the extent that they take any notice of either creation-science or theistic evolution, they consign both to the subjective realm of "religion," which has nothing to do with an objective science like biology.

Given this state of affairs, it is difficult to see what Ratzsch could expect to accomplish by his concluding recommendation that "maybe the various sides [to the creation/evolution debate] should talk. Not debate--talk. It is just possible, neither side being omniscient, that both sides could gain something from serious contact with competent practitioners on the other."

If Ratzsch is proposing a serious, mutually respectful conversation between the neo-Darwinists and the Biblical creationists, he is in need of a reality check. The position of just about everyone with any influence in evolutionary science is that creationism is not science, and its practitioners by definition cannot be competent. This is the case not only because creationists are deemed to be prejudiced by their belief that the Bible has authority over scientific questions, but even more fundamentally because they reject naturalism, which is the philosophical basis of contemporary science.

Theistic evolutionists fare little better. Most theistic evolutionists do not challenge either the conclusions of evolutionary biology or its naturalistic methodology, but argue merely that evolution by natural processes is compatible with theistic religion. To the extent that they go farther, and postulate a supernatural directing force in evolution, they violate the rules of methodological naturalism and are no more welcome in scientific discussions than outright creationists. In either case, what scientific topic is there to talk about?

For a productive scientific conversation to be even conceivable there would have to be a new force in the picture, one which is capable of entering the debate with arguments which the naturalists cannot easily refuse to take seriously. Almost halfway through his book Ratzsch discloses that a potential force of that kind has in fact emerged, a new phenomenon which he mysteriously refers to as an "upper tier" of creationists. He explains that this group consists of persons with doctorates from first-class universities, who are performing serious scientific and philosophical work to advance concepts like "intelligent design" and "irreducible complexity" as legitimate descriptions of biological reality. Although Ratzsch does not name any of the

members of this "upper tier" in his text (a few references are provided in the Notes), or discuss their work in any detail, he apparently sympathizes with their objectives and endorses some important principles that are essential to gain them a fair hearing.

In particular, Ratzsch rejects the argument that science is defined by its adherence to naturalism, pointing out that such a dogmatic standard potentially conflicts with the principle that science should be a "no holds barred" search for truth. Unless we have *a priori* knowledge that naturalism is true, then we cannot rule out the possibility that supernatural action may have affected the history of life, and that evidence of that action may exist. Ratzsch similarly rejects Richard Dawkins' argument that reference to a creator in science as the source of biological complexity is logically pernicious because it leaves the creator unexplained. *Every* explanation has an unexplained starting point. A theistic science starts with an uncreated creator; a naturalistic science starts with something like particles and natural laws, and goes on from there. *If* living organisms -- up to and including human minds -- can be created by unintelligent material processes, then the need for a creator (at least after the ultimate beginning) is greatly lessened if not eliminated. But the "if" that begins that sentence can be satisfied only by evidence, not by defining "science" to exclude any other possibility.

On similar grounds Ratzsch rejects the argument, frequently made by theistic evolutionists, that to posit action by a creator anywhere in the history of life is to invoke a futile "god of the gaps," who will inevitably be expelled from reality as science advances to fill the gaps with naturalistic explanations. Ratzsch sensibly retorts that "If there are no gaps in the fabric of natural explanation, then obviously appeal to divine activity will get us off track. On the other hand, if there are such gaps, refusing in principle to recognize them will equally get us off the track." That is particularly cogent reasoning if the so-called "gaps" involve not minor details but such fundamental problems as accounting for the existence of irreducibly complex genetic information.

In all these instances Ratzsch insists upon a principle I heartily endorse; he will not permit either side to win its case by controlling the definition of terms. Either organisms show evidence of design or they do not; either mindless processes like mutation and selection can make complex biological organisms or they can not. The determination should be made by a fair assessment of the evidence and not by defining "science" as an enterprise that inherently assumes the one possibility and excludes the other.

This endorsement of a level playing field is more radical than readers may suppose. The view that science and methodological naturalism are inseparable is widespread among many scientists and philosophers, including theistic evolutionists, and makes it impossible for them to take seriously the possibility that the creation of genetic information might require intelligence. Show them a computer program and they will never question the need for a programmer. Show them a much more impressive example of design in nature, and they will never doubt that unintelligent material processes must have been responsible for the appearance of design. Even if they give lip service to the possibility that a designer might exist, they will insist on standards of evaluation that ensure that a putative example of design can never be more than a problem that naturalistic science has not yet solved.

Ratzsch is aware that the appeal of evolutionary naturalism owes as much to moral and spiritual factors as to scientific evidence. He says in his preface that he was raised a Christian fundamentalist, and taught to respect science but to distrust Darwinism. At first he wanted to

reconcile Genesis, religion, and evolution, but at some point along the way I think I ceased to want them to be reconcilable. Evolution, along with the new cosmologies and backed by the undentable prestige of science, became part of a gratifyingly sophisticated excuse for unbelief -- a ticket out of an oppressive universe with a God who set boundaries and made demands, into one where we set the rules and the cosmos itself was the only limit. (It was this personal experience as much as anything that has convinced me that creation-evolution issues frequently run much deeper than mere scientific theory.)

I was raised as a nominal Christian, not a fundamentalist, but otherwise my story would be similar. My own realization that there is a profound relationship between naturalistic philosophy and Darwinian science led to my writing two books and many articles on this subject. It also led to my forming a rewarding colleagueship with a group of scholars and scientists whom I judge capable of holding their own in a serious conversation with the scientific naturalists. This group is the "upper tier" of professors and researchers whose existence Ratzsch so tentatively acknowledges as the new factor in the debate.

My colleagues and I speak of "theistic realism" -- or sometimes, "mere creation" --as the defining concept of our movement. This means that we affirm that God is objectively real as Creator, and that the reality of God is tangibly recorded in evidence accessible to science, particularly in biology. We avoid the tangled arguments about how or whether to reconcile the Biblical account with the present state of scientific knowledge, because we think these issues can be much more constructively engaged when we have a scientific picture that is not distorted by naturalistic prejudice. If life is not simply matter evolving by natural selection, but is something that had to be designed by a creator who is *real*, then the nature of that creator, and the possibility of revelation, will become a matter of widespread interest among thoughtful people who are currently being taught that evolutionary science has show God to be a product of the human imagination.

Our movement is something of a scandal in some sections of the Christian academic world for the same reason that it is exciting: we propose actually to engage in a serious conversation with the mainstream scientific culture on fundamental principles, rather than to submit to its demand that naturalism be conceded as the basis for all scientific discussion. That raises the alarming possibility, as one of Ratzsch's colleagues put it in criticizing me, that "the gulf between the academy and the sanctuary will only grow wider." The bitter feeling that has been spawned in some quarters by that possibility may explain why Ratzsch discusses our group so tentatively, but no matter. What matters for the present is to open up the discussion, and to that end Del Ratzsch has made a positive contribution.

Copyright © 1996 Phillip E. Johnson. All rights reserved. International copyright secured.  
File Date: 8.31.96

[replica breitling breitling replica watches](#)

<http://arn.org/searchresults.html?cx=006970942135376353348%3A2kkqoqwy-u&cof=FORID%3A9&ie=UTF-8&q=Phillip+E.+Johnson&sa=Search&siteurl=www.arn.org%2Ffile1297.htm&ref=www.arn.org%2Fauthors%2Fjohnson.html&ss=16360j28413090j16>



## **The Robot Rebellion of Richard Dawkins**

### **A Review of *Unweaving the Rainbow* by Richard Dawkins**

**Phillip E. Johnson**

Originally published in *Christian Research Journal* 22, no.1  
June 14, 2000

British biologist Richard Dawkins's latest book, *Unweaving the Rainbow*, is a set of chapters loosely connected around the theme of rebutting a poem by Keats, whose message was that "cold philosophy" spoils the charm of things like the rainbow by reducing them to physical causes. Dawkins responds, defensively but not unreasonably, that science has its own charms for those who can appreciate them. Of course it does, and so does law, or baseball, or stamp collecting.

Behind this seemingly trivial argument there are deeper issues, however, involving the long-standing dilemma of whether and how Darwinian ideology is to be reconciled with human dignity and freedom. So we can get to those issues, I will concede Dawkins' superficial point at the outset. My pleasure in the rainbow is not spoiled by knowing how Newton explained the prism effect, nor is my wonder at the miracle of vision diminished by reading the very interesting things Dawkins has to say about how it is possible for us to recognize other people by their faces.

The problem Dawkins ought to be addressing lies elsewhere. The cold philosophy that causes a sensitive human spirit to recoil is not scientific investigation but scientific materialism, the philosophical dogma that insists that only mindless matter is ultimately real and that only science holds the key to knowledge. Scientific materialism, the foundation for everything in *Unweaving the Rainbow*, is the philosophy to which Pope John Paul II referred when he wrote that "Theories of evolution which, in accordance with the philosophies inspiring them, consider the spirit as emerging from the forces of living matter or as a mere epiphenomenon of this matter, are incompatible with the truth about man."

Dawkins is a vehement scientific materialist. He has nothing but contempt for theists like the Pope, or for anyone who believes that life involves some non-material element inaccessible to science. Nonetheless, even Dawkins recoils from the logic of his own position.

According to Dawkins, as described in his previous book, *The Selfish Gene*, evolution is a story about competition among genes. Once upon a time, chemicals somehow organized themselves into a DNA-based system that could reproduce itself. The first organism to emerge from the chemical soup was a naked gene, a length of genetic material that did little else but reproduce. But the naked gene spawned offspring, and in the fullness of time some of those offspring learned to build bodies (phenotypes, in scientific jargon). The only purpose of the bodies was to enable the genes to reproduce their own kind more effectively. As the saying goes, a chicken is just an egg's way of making another egg.

Although there are powerful dissenters, gene selectionism is sufficiently dominant among evolutionary scientists that it is frequently referred to simply as "modern Darwinism." From

this basic assumption it follows, to quote Dawkins' colorful prose, that humans (like other organisms) "are machines created by our genes. Like successful Chicago gangsters our genes have survived ...in a highly competitive world.... I shall argue that a predominant quality to be expected in a successful gene is ruthless selfishness.... When he is in his full reductionist flight, Dawkins does not hesitate to draw the logical conclusion. "We are survival machines--robot vehicles programmed to preserve the selfish molecules known as genes." [Quotes are from *The Selfish Gene* (TSG), 1976 edition, pp. v, 2.]

That is indeed a cold philosophy. It seems to imply that it may be very natural for "robot vehicles" to murder, rob, rape or enslave other "robots" to satisfy their genetic masters. Modern Darwinism seems also to leave little basis for valuing the humane arts like poetry and music, except to the extent that such things are useful in spreading the genes by (for example) building tribal solidarity. Nineteenth Century Darwinists, writing mainly for other members of a social elite, might have been able shrug aside such objections on the ground that science requires that we take an unsentimental view of the realities of life. Darwin himself frequently wrote of "savages and lower races" as intermediate between animals and civilized people, and in the *Descent of Man* he coolly predicted that the whites would exterminate these intermediate forms because that is how natural selection works. Hitler, Stalin, and Mao have demonstrated what that casual attitude towards mass murder leads to in practice, however. In consequence, even today's most ruthless Darwinists have to make some concessions to morality.

Modern Darwinists can respond that selfish genes do not always make selfish people, because it may be in the interests of the genes to encourage some forms of social cooperation, particularly within the family. For example, a mother might spread her genes most effectively by sacrificing her own life to preserve the lives of her offspring, who carry the same genes.

That's a pretty weak reassurance when contemplating the kinds of things that commissars and fuhrers tend to do. Stronger medicine is required if Darwinism is to avoid the obloquy that now attaches to "social Darwinism," and so Dawkins desperately tries to square his gene theory with some acceptable morality by proposing a robot rebellion. He writes: "Let us try to teach generosity and altruism, because we are born selfish. Let us understand what our own selfish genes are up to, because we may then at least have the chance to upset their designs, something that no other species has ever aspired to." (TSG, p. 3)

This is not only absurd but embarrassingly naive. If human nature is actually constructed by genes whose predominant quality is a ruthless selfishness, then pious lectures advocating qualities like generosity and altruism are probably just another strategy for furthering selfish interests. Ruthless predators are often moralistic in appearance, because that is how they disarm their intended victims. The genes who teach their robot vehicles not to take morality seriously, but to take advantage of fools who do, will have a decisive advantage in the Darwinian competition. If a man is preparing his son for a career with the Chicago mafia, he'd better not teach him to be loving and trusting. But he might teach him to feign loyalty while he is planning treachery!

There is an even more fundamental problem with the robot rebellion, however. Just who is this "we" that is supposed to do the rebelling? Like other Darwinian reductionists, Dawkins does not believe that there is a single, central self which utilizes the machinery of the brain for its own purposes. The central self that makes choices and then acts upon them is fundamentally a creationist notion, which reductionists ridicule as "the ghost in the machine."

Selfish genes would produce not a free-acting self, but rather a set of mental reactions that compete with each other in the brain before a winner emerges to produce a bodily reaction that serves the overall interests of the genes.

In a recent joint lecture, Dawkins asked his colleague Steven Pinker: "Am I right to think that the feeling I have that I'm a single entity, who makes decisions, and loves and hates and has political views and things is a kind of illusion that has come about because Darwinian selection found it expedient to create that illusion of unitariness rather than let us be a society of mind?" Pinker answered affirmatively that "the fact that the brain ultimately controls a body that has to be in one place at one time may impose the need for some kind of circuit . . . that coordinates the different agendas of the different parts of the brain to ensure that the whole body goes in one direction." That hypothetical circuit is all that remains of the illusion of a free-acting self. [The Dawkins-Pinker exchange is available at [www.edge.org](http://www.edge.org)]

British lecturer in psychiatry Susan Blackmore takes this logic even further in her 1999 book *The Meme Machine* (London: Oxford University Press, 1999), which comes with an introduction by Dawkins himself. Dawkins invented the concept of memes to extend Darwinism into the realm of ideas and expression. Memes reproduce by being copied in brains, and they are altered by copying errors. As Blackmore describes it, "Everything you have learnt by copying it from someone else is a meme. This includes your habit of driving on the left or right, eating beans on toast, wearing jeans, or going on holiday. . . . Memes are 'inherited' when we copy someone else's action, when we pass on an idea or a story, when a book is printed, or when a radio program is broadcast. Memes vary because human imitation is far from perfect.... Finally, there is memetic selection. Think of how many things you hear in a day, and how few you pass on to anyone else."

Dawkins originally proposed the meme idea cautiously, but his followers have made it (with his approval) the basis for a complete philosophy of mind. Just as the selfish genes make the body, selfish memes supposedly make the mind. Blackmore speculates that the brain evolved as a vehicle for spreading useful memes. As the selfish memes co-evolve with each other, they form complex memetic systems like languages, religions, scientific theories, and political ideologies. Their most powerful creation, however, is the illusion of the self. "We may feel as though we have a special little 'me' inside, who has sensations and consciousness, who lives my life, and makes my decisions. Yet, this does not fit with what we know about the brain."

I don't have space to explain this zany idea further. What is most significant for present purposes is her conclusion: "Dawkins ends *The Selfish Gene* with his famous claim that 'We, alone on earth, can rebel against the tyranny of the selfish replicators.' Yet, if we take his idea of memes seriously, and push it to its logical conclusion, we find that there is no one left to rebel."

One way or another, whether the brain is built by selfish genes or selfish memes, Darwinian philosophy insists that the unified self is an illusion and there is no one left to rebel against the selfish replicators. I surmise that all the chatter about the charm of science in *Unweaving the Rainbow* is designed to deflect attention from the unattractive aspects of this philosophy by portraying its critics as know-nothing opponents of scientific investigation. The materialist worldview Dawkins promotes preaches that human bodies exist to further the spread of gangster-like selfish genes, and that the self is nothing but an illusion created by some combination of genes and memes. In Blackmore's words, "We all live our lives as a lie. The

memes have made us do it--because giving us the illusion of 'self' helps them to survive and spread."

In this reductionist world ideas are not good or bad, ugly or beautiful. They differ only in "infectivity," which is the capacity to induce brains to copy them. The notion that the poetry of Keats is "sublime" is itself merely a meme which increases copying by brains whose governing memes have produced a taste for things with a reputation for sublimity. Bad poems or ideas are as likely to be successful in this sense as good ones--indeed, "good" and "bad" are meaningless terms for a memetic reductionist. Dawkins himself insists that some of the most effective replicators are "viruses of the mind," meaning religions (especially Christianity), which he despises. The only criterion of success for a meme or a gene is frequency of reproduction.

Why would poets and artists--or any group of thinking people who value the mind--be attracted to a philosophy that is so tailor-made to encourage murderous barbarians? And why should they believe that gene/meme reductionism has any foundation in fact? The ultimate irony is that this philosophy implies that Darwinism itself is just another meme, competing in the infectivity sweepstakes by attaching itself to that seductive word "science." Dawkins ceaselessly urges us to be rational, but he does so in the name of a philosophy that implies that no such thing as rationality exists because our thoughts are at the mercy of our genes and memes. The proper conclusion is that the Dawkins poor brain has been infected by the Darwin meme, a virus of the mind if ever there was one, and we wonder if he will ever be able to find the cure.

The *Christian Research Institute Journal*: <http://www.iclnet.org/pub/resources/text/cri/cri-home.html#journal>

Copyright 2000 Phillip E. Johnson. All rights reserved. International copyright secured.  
File Date: 7.5.00

[replica breitling breitling replica watches](#)